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ROYAL BOTANIC GARDENS, KEW

XLIII—PLANT-HUNTING IN ALASKA.

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The territory of Alaska is about one fifth the size of the United States. It stretches from the 51st to the 72nd parallel, its northern extremity, Point Barrow, lying in about the same latitude as Norway's North Cape, though the long arm of the Aleutian Peninsula, stretching nearly to Japan, diverts the warm Japanese current southward to the shores of south-eastern Alaska and British Columbia, in which region, known as the "pan-handle," it profoundly modifies the climate. Between this region and the tundras bordering the Beaufort Sea—where the ground is constantly frozen to within about 1½ feet of the surface—Alaska possesses all varieties of climate from the sub-tropical to the arctic, and in my journey around its coasts in 1933 in search of plants and Eskimo curios, temperatures from 100 degrees Fahrenheit in the sun, to 92 degrees Fahrenheit below zero, were encountered. The diversity of plant-life is thus great.

Alaska, particularly in her coastal "pan-handle," is a land of berries. In an interesting report on the Indian villages of south-eastern Alaska, Mr. Herbert W. Krieger, of the United States National Museum, has some observations to make about them which are worth repetition:

> "Berries constitute an important part of the native's food supply. No variety is cultivated, although a hardy variety of raspberry was introduced by the officers of the garrison formerly stationed at Fort Tongass when that place was the seat of a custom-house and the first port of call for American ships out of Seattle. This variety of raspberry is now cultivated in gardens at Ketchikan and is yielding large crops of berries. As a matter of record no plant other than a kind of wild tobacco (*Nicotiana attenuata* Torr. ex. S.Wats.) was formerly cultivated by the natives. To-day there is a plentiful supply of potatoes, turnips, and other vegetables cultivated in small gardens throughout the entire region.
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> "Berries grow wild in south-east Alaska in great abundance. There are currants, cranberries, salmonberries, strawberries, soapberries, huckleberries, and others. Huckleberries are preserved in oil. The soapberry is beaten into a cream resembling strawberry ice-cream.

" A variety of wild celery matures in May and is gathered by the natives. They peel off the outer skin and eat the inner stem as we do celery, but no salt is used. Salt appears not to have entered extensively in the list of native foods of Alaska before the days of the white man. Observations in the interior in the valley of the Yukon bear out this fact, as nowhere did the natives use salt either as a condiment or as a preservative. The inner white bark of young spruce trees or of the hemlock formed a considerable part of the food supply of the Haida and Tlingit. This was cooked. Scrapings of spruce bark were moulded into cakes and consumed later, together with oil as seasoning."

As my journey through Alaska began in June, and I left Nome, on the Seward peninsula, for Point Barrow in the first days of August, before the berries or seeds ripened, I had unfortunately no opportunity to taste any of these berries in a fresh state, but Nome housewives assured me they were delicious and much in use for preservation.

As far as my own observations went amongst the Eskimo population of arctic Alaska (where almost the only edible berries are the crowberry, *Empetrum nigrum* L, and the blaeberry, *Vaccinium uliginosum* L.), I found that this untidy, meat-loving people, who are probably the worst horticulturists in the world, nevertheless have a few favourite salads. Though they seldom make the slightest attempt to cultivate plants (and at Nome the Eskimo section of the village is distinguished only by the most extraordinary growth of tin cans and old iron I ever saw accumulated on any beach), I met several parties of women near the town gathering the young leaves of the willow, which, mixed with seal-oil, were used as a salad. On another occasion I encountered a woman on the shore gathering from the rocks the leaves of *Rhodiola alaskana* Rose (which is common around Nome). She explained to me that it was used as a beverage mixed with hot water only (oil must not be added). A species of *Claytonia* (*C. tuberosa* Pallas) is probably (though not certainly) the plant known in Alaska as the " Eskimo potato." Of this the natives eat the roots. This Eskimo " potato " is said to grow profusely on King Island, a lonely rock in the Bering Strait whose few inhabitants spend their summers in Nome. As I had no opportunity to visit King Island I was unable to verify this statement or determine the actual plant with certainty. The wild Angelica (which in Greenland is called " kvan " and the stems of which are in much demand as a food by the natives of that country) is also said to be eaten by the Alaskan natives, though I did not come across the plant in any quantity round Nome. *Oxyria digyna* (L.) Hill is another herb eaten by the Eskimos as a salad mixed with seal-oil, but with these exceptions I came across no other plant in the native larder of arctic Alaska.

Ledum groenlandicum Oeder., which covers countless acres of cleared timber land around Fairbanks, and which also occurs on the

tundras of the Seward peninsula, is called " Labrador tea " by the white people, and is said to be used as tea by the Eskimos of the eastern Arctic, though I came across no instance of its use in this way in Alaska. Perhaps too close contact with the gold-diggers of Nome has taught the native there to crave the stronger " moonshine," in the illicit distillation of which many of them are experts ! Tea, however, is the national drink of the American Eskimo, just as coffee is the beverage of his Danish cousin of Greenland.

Tobacco in any form is the principal " vice " of the native, a habit which was perhaps acquired from the aboriginal Indians from whom the white men took their first love of nicotine. Chewing-gum, however, in this American territory, is beginning to run it pretty close. I heard of one little orphan whose sad plight was thus described to the missionary—" Poor little boy. No father—no mother—no chewing-gum ! " If they cannot get it at the trading-store, the Indian and Eskimo (and even the white trapper) who live in the timber areas will often obtain gum direct from the resinous spruce.

The forests of Alaska are one of her most important commercial resources. The country has two distinct types of forest, the " interior " forest and the " coast " forest. The latter has largely been included in the national forest system of the United States. The Tongass Forest, of south-eastern Alaska, over 16,000,000 acres in extent, and the Chugach Forest of nearly 4,800,000 acres, covering the shores of Prince William Sound, have been placed under the supervision of the forest service. The principal trees of the interior forest are the white spruce (*Picea alba* Link), white birch (*Betula papyrifera* Marsh.), balsam poplar (*Populus balsamifera* L.), cottonwood (*Populus sp.*), black spruce (*Picea nigra* Link) and Alaska larch (*Larix alaskensis* Wight). The latter tree was first described by Mr. W. F. Wight about the beginning of this century. Its distribution is the Upper Kuskokwim River to the Yukon and Tanana rivers. It differs from *L. laricina* C. Koch (according to the description given by Mr. Wight) " in its usually shorter leaves, but more particularly in its cones. The cone scales are longer in proportion to their breadth ; the bracts of the cone scales are ovate and without a projecting mucronate point at their apex.—From *L. dahurica* Turcz., the most closely related Asiatic species, it differs in its usually shorter leaves, in its smaller cones, with the cone scales less widely spreading in dried specimens, and in its narrower cone bracts."

The Sitka spruce (*Picea sitchensis* Carrière) is the most valuable tree in Alaska. As both it and the hemlock (*Tsuga Albertiana* Sénécl.) of the coastal forests are excellent pulping woods, the future of Alaska's timber industry is—we are told—in the manufacture of pulp and paper, especially newsprint paper. As the tourist gazes from the comfortable decks of his steamer upon the wooded heights which close the Inside Passage, with distant views of snow-splashed

glaciers, it is a sobering reflexion that these national forests (as his guide-book tells him) are capable of producing not less than a million tons of newsprint " annually in perpetuity," which is a quarter of the present total requirements of Uncle Sam ! " Stated in another way, the annual growth of timber in south-eastern Alaska is sufficient to supply eight newsprint mills, each of 400 tons daily capacity, with raw materials and a livelihood for some 50,000 people—a number almost equal to the present total population of the territory."

The river-boats on the Yukon burn wood, and the monotony of the journey is varied by an occasional pause at a woodpile on the bank to take on fuel. The boats on the British section of the river alone consume about 8000 cords in a season—a considerable drain even on the vast resources of Yukon forests which there seems to be as yet small hurry to repay.

Near one of these woodpiles, on my way down-river from Whitehorse to Dawson, I gathered not far from the village of Carmacks some typical specimens of Yukon riverside flora. *Hedysarum americanum* (Michx.) Britton and its close relative *H. Mackenzii* Richards., *Dryas octopetala* L., *Fragaria yukonensis* Rydb., and the low red-flowered " wineberry " (*Rubus acaulis* Michx.) which is one of the most frequent species. The lovely *Anemone patens* L. also grew in profusion under the willow-scrub, but in early June the flowers were already over and it was setting its silvery seed-whisk fruit. This flower is one of the first to appear through the snows of spring.

Though I was assured that only two weeks before my visit to Dawson the ground had been covered with snow, by the time I had established myself in the Royal Alexandra Hotel (its sole guest at this early season) the sudden summer had already arrived, and the thermometer at the police barracks ran up to 100 in the shade. With the sunshine the undesired mosquito also began to make her appearance, but so did the flowers, and their wealth and beauty in the woods and on the Dome mountain some 1000 feet above the town (which is already some 1080 feet above sea level) almost compensated even for these pests. One of the most conspicuous flowers to arrest the eye of a stranger is the blue *Mertensia paniculata* (Ait.) Don which the Canadians call the " bluebell." I first saw this fine flower growing in a ditch by one of Dawson's dilapidated side-walks, but was soon to see it everywhere.

My earliest excursion took me through the woods behind the town up the steep slopes to the summit of the Dome mountain—a delightful walk during which I passed through a variety of plant formations to the " Hudsonian zone " of the summit, where, the poplar and spruce woods left behind, I came out upon a height from which a magnificent view of the snow-piled fractured tops of the Rockies around the Klondike and Yukon valleys rewarded me for the somewhat arduous climb. Here I was able to fill my press with such lovers of the high places as *Arenaria arctica* Stev. (which

also carpets the hillsides of the Seward peninsula round Nome in magnificent snowy tufts from June to early July), *Cerastium maximum* L., *Dryas octopetala* L., *Lycopodium alpinum* L., *Saxifraga bronchialis* L., and *S. reflexa* Hook., the cranberry (*Oxycoccus quadripetala* Gilib.), the golden Arnica (*A. alpina* (L.) Olin and Laden) and many others. The woods on the lower slopes of the mountain were bright with lupin (*Lupinus arcticus* S. Wats.) which fills the place of the English hyacinth in the forests of Yukon and Alaska, the tall golden bushy potentil (*Potentilla fruticosa* L.), a handsome species, almost a shrub, which is common also on the treeless tundra behind Nome, wild roses, yellow and white anemones (*Anemone Richardsonii* Hook. and *A. parviflora* Michx.) and, in shadier recesses, one of the most beautiful of all Yukon's wild flowers, the creamy " pine-drop " on its blush-pink stem (*Pyrola grandiflora* Radius). It seemed a sad business to have to place it between the pressing-boards ! (In passing, I may mention that, especially in hot weather, I found that very much better results were obtained with the specimens when placed immediately they were gathered between paper and boards. The latter, as supplied by Kew, are so light to carry that they are really more convenient than a vasculum.)

The scenery of the American section of the Yukon beyond Dawson is very similar to the Canadian. There is the same monotone of forest and distant mountain, though just before Fort Yukon is reached (where the mighty stream takes a right-angled sweep westward to her far destination on the shores of the Bering Sea) the river widens into a kind of inland lake—the Yukon Flats—some twenty miles from bank to bank. Just before this the Arctic circle is crossed at Circle City. At the latter town I gathered in the muddy banks of the river an interesting species of plantain with narrow leaves ("*Plantago media* L. or possibly a hybrid with *P. lanceolata* L.").

My river-journey ended at Nenana, a little town on the Tanana river, whence a short railroad runs to Fairbanks, the largest inland town in Alaska (Juneau, on the coast, is the capital) and the site of the College of Agriculture—"the most northerly college in the world." But I had unfortunately no time to visit this interesting building, for a plane was leaving that very afternoon for Nome, and as boats on the lower Yukon were very uncertain, I had decided to shorten my journey greatly by taking to the airways. I was anxious to reach Nome before any north-bound vessel (which were few and far between in an area where there was no longer any tourist travelling) should leave for Barrow. Nenana is memorable to me for my first sight of the showy Indian paintbrush (*Castilleja pallida* Kth.) which flourished in the railway siding near the station, and at Fairbanks I caught a first glimpse of the lovely blue Iris (*Iris setosa* Pallas) which I was afterwards to see covering the marshes round Nome.

After crossing the high range of mountains which divides the Yukon valley from the Bering Sea and Norton Sound, the pontoon plane landed us in the Nome river on the second day after leaving Fairbanks (owing to bad weather reports we had spent one night at Nulato, a little Indian village on the lower Yukon). As the ice in 1933 was particularly heavy, I was detained at Nome for five weeks, waiting for a chance to get north, so that most of my plant-collecting for Kew was done in the neighbourhood of that "city" (which later, in September 1934, was almost completely wiped out by fire).

At Nome I met Mr. Charles Thornton, United States Commissioner, and an expert botanist, who has discovered recently in the neighbourhood of Nome a new species of Senecio which now bears his name. Mr. Thornton estimates that 278 named species of flowering plants are known within 50 miles of Nome, besides about 150 species of mosses, lichens, ferns, fungi and algae. My collection for Kew from Yukon and Alaska consists of 707 specimens, comprising some 228 species, and as the majority of the Alaskan flowers were gathered within fifty miles of Nome, by the time I left for the north on 2nd August it was becoming quite an event for either Mr. Thornton (who kindly assisted me many times in the search by taking me further afield in his car) or myself to light upon any species which had not already been collected. Only twice was I able to find a plant which puzzled my guide. One of these was the little *Coeloglossum viride* (L.) Hartm., which I took near the summit of Anvil mountain but only found twice. The other was an unusual species of saxifrage (*S. spicata* Don) which I caught sight of from the car growing on the rocks above the precipitous roadway round Cape Nome on the last evening before I left for Barrow.

The Regius Keeper of the Edinburgh Botanic Gardens had asked me to keep a special look-out for any native Primulas, and on my very first walk abroad over the flat hinterland behind the town I came on an abandoned gold dredge beside a "creek" (as streams are called in Alaska) where the damp ground was covered with the very beautiful little *Primula eximia* Greene, dusted with white meal, its small violet blossoms smelling sweet as any garden "dusty miller" of home. Beside it grew *Dodecatheon frigidum* Cham. et Schlecht.—the "Shooting Star" or wild Cyclamen—a very lovely species frequent round Nome in early July. It is impossible here to do more than indicate a very few of the blossoms which rush out, flourish, fade and set seed within the brief period of the Nome summer. They certainly exceeded the expectations I had perviously formed both in beauty and number. As the country is here quite treeless—save for a few willow and, more rarely, alder bushes by the rivers—the vegetation is chiefly of an alpine character, and the end of June is about the best time for flower-gathering. By the end of July, the flowering period being so short, the magnifi-

PLATE IX

Rubus acaulis Michx. and *Lathyrus maritimus* Bigel. on Nome beach.

Boykinia Richardsonii (Hook.) A. Gr. near Nome.

Therorhodion glandulosum Standley on the summit of Anvil Mountain.

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cent patches of magenta Phlox (*Phlox sibirica* L.) had already faded upon the hillsides and monkshood (*Aconitum delphinifolium* DC.) and tall blue Delphinium (*D. Menziesii* DC.) were about to replace the beautiful *Polemonium caeruleum* L. and *Epilobium latifolium* L. Sheets of the latter brilliant plant, with its beautifully contrasting sea-green anthers, cover the dry slopes of creek-beds and hillsides in July, and an occasional snow-white " albino " may be found by Snake River, where the third and rarest of Nome's Primulas, the pale pink *P. sibirica* Jacq., with its twin blossoms, is occasionally discovered. *P. stricta* Hornem. is Nome's most common primula. By the river also grows a handsome Pedicularis (*P. sudetica* Willd.) a genus of which I collected seven species round Nome.

On the summit of Anvil Mountain, and elsewhere, patches of a very attractive dwarf Rhododendron (*Therorhodion glandulosum* Standley) grew plentifully. The handsome flowers of this little plant are much larger than those of *Rhododendron lapponicum* Wahlenb. which covers so much of the Greenland mountains, and which is also to be found in Alaska. The curious green *Veratrum Eschscholtzianum* (R. et S.) Rydb.—a tall orchid-like plant—the graceful *Anticlea elegans* (Pursh) Rydb., and the interesting *Boykinia Richardsonii* (Hook.) A. Gr., with its snow-white flowers and dull-red eye, its long hispid stem rising from rather coarse leaves, were among handsome species gathered. Unfortunately, when I left Nome on 2nd August, it was still too early to gather seed of any plants save *Petasites frigidus* Fr.—a very common edging to Nome roadsides which was already putting forth its grey silky pappus. *Eriophorum Scheuchzeri* Hoppe and *E. angustifolium* Roth were also common by the high-way and in the damp tundra at the back of the town. A particularly fine Senecio (*S. palustris* (L.) Hook. var. *congestus* (R. Br.) Hook.) covered the deserted clay bottoms of Center Creek with gold in late July, and grew at times to a height of nearly four feet. By this time also the marshes were blue with *Iris setosa* Pallas, and I spent much time in the difficult art of nature-photography. Many were the films I wasted on this most fascinating of occupations ; a breath of wind ruffling *Boykinia* just as my shutter opened ; an inch too near ruining the focus of a fine group of *Saxifraga Hirculus L.* Gradually, however, as I became more conversant with the rather difficult light of this far northern land, the results began to repay me for time spent. Three of my photographs are here reproduced (Plate IX).

On August 2nd, having obtained a passage to Barrow in a small trading schooner of ten tons, with a crew of three, I set out for the far north of Alaska. Our first call was at Cape Prince of Wales —the American continent's most westerly extremity some 60 miles from Siberia. Rough weather obliged us to anchor for shelter behind the cape for a couple of days, which was fortunate, for this spot—the site of America's only tin mine—is amazingly rich in wild flowers. The hillsides were literally golden with large patches of

Saxifraga Hirculus L., and bright with Alaska's national emblem, *Myosotis alpestris* Schmidt, and shell-pink "Spring Beauty" (*Claytonia sarmentosa* C. Mey.), *Arenaria arctica* Stev. and *Polygonum bistortoides* Pursh. Going ashore, we found on the beach the wood-shack belonging to the joint-owners of the tin mine, Mr. Waldhelm and Mr. Maclean. It was apparently empty, and as "Trader's" owner, Mr. Ira Rank, and the Icelandic brothers Pete and Kari Pálsson (captain and engineer), knew Mr. Waldhelm, I left on the table (for fun) a little note of thanks for the wild flowers we had gathered round his dwelling (which included two species not seen at Nome, *Lloydia serotina* (L.) Sweet and *Oxygraphis glacialis* Bunge), together with an English penny which I happened to find in my pocket! "Won't he wonder where on earth we've sprung from when he sees this!" cried Pete (for visitors to the deserted shores of Tin City are as rare as blackberries in January). But when we came back from a short walk up the hills, and were preparing to return to our tossing quarters in the little schooner, we found smoke rising from the chimney of the shack. Mr. Waldhelm, at work some miles inland, had seen our vessel and was busy in the kitchen—with true Alaskan hospitality—making a "mulligan" for our supper!

In her northern extremities, around Point Barrow, Alaska tails out into flat tundra, the coasts fringed with dangerous shoal-waters, "Trader" was caught by the ice for fifteen days some 25 miles south of Barrow village, and during our enforced imprisonment we were able to land and explore the district. The plants still in evidence in late August amid the first light snows of winter were *Saxifraga cernua* L., *Saxifraga bronchialis* L., *Petasites frigidus* Fr., *Eriophorum Scheuchzeri* Hoppe, *Carex compacta* R. Br. and the yellow arctic poppy, *Papaver nudicaule* L., which grows all up the coasts of this region, and which I actually found frozen into a solid jacket of ice in "cold storage," upon the sands near Martin Point, on the Arctic coast in October.

At Martin Point I found awaiting me my last and one of the most interesting species, Alaska's fourth (and last) Primula, *P. borealis* Duby, which the trader with whom I boarded there had gathered (in a little tin) with roots and water before his departure for Barrow 400 miles distant in July, and which was still flourishing in the deserted cabin when we reached it in mid-September! Little did Mr. Masik (an ex-member of Dr. Stefansson's Canadian Arctic Expedition) think when he gathered it to decorate his table, that it was destined to end in Kew Herbarium!

The only other plants collected in this remote region east of Barter Island at this late season after the "freeze-up," were *Papaver nudicaule L.* and a procumbent species of willow (*Salix glacialis* Anders.) which still projected from the first snows covering the spit in early October.

XLIV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXII.* N. Y. Sandwith.

The Genus Swartzia in British Guiana.

So much herbarium material of this important genus has accumulated from British Guiana in recent years that it seemed worth while to give a key to the species occurring in the colony with descriptions of those which were found to be new. It was a surprise to find that no fewer than eighteen Swartzias are natives of British Guiana, while further indeterminable material probably brings the number up to twenty. Of these, nine are unknown at present outside the colony, and three are described as new. The work has been comparatively easy owing to Bentham's excellent monograph of *Swartzia* in Martius' " Flora Brasiliensis " which included descriptions of several of the British Guiana species.

The species may be large trees of the coastal rain-forests, or small trees of river-banks and open savannahs. Some of them occur in all three habitats and vary accordingly in height. The coastal forest species seem to occur in several consociations ; thus two Itikiburaballis (an Arawak name given to several species of the genus), *S. Benthamiana* and *S. xanthopetala*, occurred in Wallaba (*Eperua*) forest on sandy ridges near the Moraballi Creek, Essequibo River, while the conspicuous fluted tree, Parakusan (*S. Schomburgkii*), is locally plentiful in certain mixed forest. Wamara (*S. leiocalycina*) is apparently another mixed forest species, while Serebedan (*S. oblanceolata* or other species) was recorded from all the consociations by the Moraballi Creek. The species probably prefer a sandy soil and at least two, *S. latifolia* and *S. dipetala*, are confined to the sandy savannahs near Pirara and the Rio Branco ; while three others, *S. roraimae*, *S. oblonga* and *S. pachyphylla*, are only known from high altitudes on and about Roraima. Several of the larger coastal forest species are well known as hard woods but are of little commercial importance. Record (Timbers of Tropical America, 257) mentions only one, *S. tomentosa*, which he identifies with the Wamara of British Guiana, but Kew material sent in as Wamara is *S. leiocalycina*.

Species of *Swartzia* are usually clearly defined and many easy characters can be selected for distinguishing them, as will be seen from the following key. One species, however, *S. tomentosa*, appears on present evidence to be unusually fluid in several characters, and some botanists would make at least four species out of as many collections which are here provisionally interpreted, without confidence, as varieties. Another species, *S. Benthamiana*, is almost equally perplexing and seems to be certainly polymorphic in the size of its floral parts.

The more primitive Swartzias would seem to be large forest trees with a wingless leaf-rhachis, inflorescences among the leaves, a

* Cont. from K.B. 1934, 258.

large yellow petal which is hairy on the back, very numerous stamens in two series, a long pluriovulate ovary and style, and a long many-seeded fruit. The British Guiana species which approximates most closely to this definition is certainly *S. Sprucei* which is, however, a quite small tree of river banks. *S. xanthopetala* has all the qualifications except for its cauliflory. The other species exhibit all kinds of modifications and adaptations such as low shrubby habit, winged leaf-rhachis, unifoliolate leaves, alternate leaflets, cauliflory, small glabrous white petals, apetaly, few or uniseriate stamens, short ovaries and short, often excentric, styles, and small few-seeded fruits. *S. dipetala* (*S. dicarpa*), with a small yellow petal, has two carpels and may belong to the most primitive type of the genus of which *S. polycarpa* Ducke represents the most extreme form; otherwise it is closely allied to the white-petalled *S. Benthamiana* which seems to be a representative of a much more recent type. It is obvious, however, that the species dealt with below could not be placed in any true evolutionary sequence, with indications of their closest affinities and links, without a complete survey of the whole genus and its relatives. They have therefore been placed in the order which seemed to indicate the age of at least some of them, and are otherwise grouped by considerations of facies and affinities in characters used in the artificial key. The colour of the petal of the following species is known: yellow, *Sprucei, xanthopetala, tomentosa, pachyphylla, grandifolia, latifolia, oblanceolata, dipetala, arborescens*; white, *Schomburgkii, Benthamiana, alterna.*

It may be remarked, finally, that the name of this genus, *Swartzia* Schreb., is conserved both against earlier names, such as *Tounatea* Aubl., and also against all earlier homonyms, such as the bryophytic *Swartzia* Hedw. (1789).

Key to the British Guiana species of Swartzia.

Leaves all 1-foliolate; style very short, much less than 5 mm.:
- Leaflets caudate-acuminate; gynoecium wholly villous-tomentose ....11. **eriocarpa.**
- Leaflets not or very shortly, broadly and bluntly acuminate; gynoecium wholly glabrous.....10. **oblonga.**

Leaves with 3 to several leaflets, the uppermost rarely reduced to a single leaflet; style long or short:
- Stamens only about 20 or fewer, subequal or those of the longer series with larger anthers the more numerous and conspicuous:
  - Leaf-rhachis winged; leaflets opposite; stamens in two series, the anthers of the conspicuous longer series small and suborbicular; style short, less than 5 mm....17. **arborescens.**
  - Leaf-rhachis not winged; leaflets alternate; stamens subequal, the anthers long and linear-oblong; style long, 5 mm. or longer ..... 18. **alterna.**
- Stamens very numerous, dimorphous, those of the short series with small anthers by far the more numerous and conspicuous:

Style very short (much less than 5 mm.), more or less curved or inflexed :

Petal absent ; leaf-rhachis somewhat winged, particularly below the junction of the petiolules ; larger stamens with short thick filaments about as long as the anthers.....
16. **guianensis.**

Petal present ; leaf-rhachis not winged except in *S. oblanceolata ;* larger stamens with long thin filaments much longer than the anthers :

Stipe and ovary wholly glabrous :

Lower surface of leaflets and inflorescence only minutely puberulous or glabrate ; leaf-rhachis definitely winged
12. **oblanceolata.**

Lower surface of leaflets and inflorescence with a dense indumentum ; leaf-rhachis not winged :

Lower surface of leaflets and inflorescence woolly-pilose or tomentose ; buds large, more than 1 cm. long, fulvous-tomentose ; petal large, more than 2·5 cm. wide. ..... 9. **roraimae.**

Lower surface of leaflets and inflorescence finely sericeous-tomentose ; buds very small, apiculate, drying black and glabrous except at the base ; petal very small.....13. **leiocalycina.**

Stipe and ovary densely sericeous-tomentose :

Leaflets neither obovate nor obovate-oblong ; ovary short, 5 mm. long or less, obovoid or obovoid-oblong :

Petiolules 2 mm. long or less ; pistils 2 in each flower...
15. **dipetala** (*dicarpa*).

Petiolules 4–8 mm. long ; pistils solitary.....
14. **Benthamiana.**

Leaflets obovate or obovate-oblong ; ovary linear-falcate, more than 5 mm. long ..... 6. **latifolia.**

Style long, exceeding (often considerably) 5 mm.:

Inflorescence with a pale whitish or ochraceous tomentum ; bracts minute ; petal glabrous on the back, or very obscurely and sparsely hairy on some of the veins :

Inflorescence finely scaly-sericeous-tomentose ; buds up to 6 mm. diam. before splitting ; pistil completely glabrous
7. **Schomburgkii.**

Inflorescence woolly-tomentose ; buds 7–10 mm. diam. before splitting ; ovary sericeous-tomentose.....
8. **Jenmani.**

Inflorescence with a dark fulvous or fuscous tomentum ; bracts conspicuous, boatshaped ; petal conspicuously hairy on the back, at least on the veins and towards the base :

Stipe and ovary tomentose :

Leaf-rhachis winged ; bracteoles present, conspicuous :

Leaflets very coriaceous, strongly reticulate beneath with thick veinlets ; inflorescence covered with a coarse brownish-chocolate woolly tomentum ; ovary coarsely villous-woolly...4. **pachyphylla.**

Leaflets chartaceous to thinly coriaceous, finely reticulate beneath ; inflorescence covered with a fine brownish-chocolate more or less sericeous tomentum ; ovary adpressed - sericeous - tomentose **5. S. grandifolia.**

Leaf-rhachis not winged ; bracteoles absent or not apparent.....3. **tomentosa,** var. **Altsoni.**

Stipe and ovary glabrous ; leaf-rhachis not winged :

Inflorescences axillary among the leaves ; leaflets very finely pubescent or glabrescent beneath, not reticulate, only the midrib and main lateral nerves prominent, the rest inconspicuous or impressed ; bracteoles absent or not apparent ... 1. **Sprucei.**

Inflorescences arising from old branchlets below the leaves ; leaflets coarsely pilosulous or woolly beneath and conspicuously reticulate with prominent veinlets :

Bracteoles present and evident ; ovary at least 1·5–2·5 cm. long.....2. **xanthopetala.**

Bracteoles absent or not apparent ; ovary only 1 cm. long or less ..... 3. **tomentosa.**

ENUMERATION.

1. **S. Sprucei** *Benth.* in Mart. Fl. Bras. **15**, pars 2, 37 (1870).

Demerara River, fl. June, *Jenman* 6551. Groete Creek, towards mouth of Essequibo River, fl. Oct., *Brinsley* in *Forest Dept.* no. 1001 : tree 6 in. diam., along sides of the creek. Kurupung, Upper Mazaruni River, 1922, *Leng* 115 (New York).

Vernacular name, *itikibouraballi* (Arawak).

Distr. Amazonian Venezuela (Rio Casiquiare and Rio Pacimoni, *Spruce*).

Noted by Spruce as a small riverbank tree with yellow flowers. The lower surface of the leaflets presents a curiously smooth appearance since only the midrib and principal lateral nerves are at all prominent ; the rest of the surface is pale and glaucous, and covered with a rather thin adpressed pubescence which disappears with age. Not recorded hitherto from British Guiana.

2. **S. xanthopetala** *Sandwith* in Kew Bull. 1931, 359.

Moraballi Creek, Essequibo River, fl. Oct., *Sandwith* 388 (type). Demerara River, fl. Aug., *Jenman* 4505. Kuruabaru River, Demerara River, fl. Sept., *Hohenkerk* in *Forest Dept.* no. 812 (one of the sheets of this collection bears leaflets, and perhaps flowers, of

S. grandifolia). Kerimero Creek, Berbice River, fr. Oct., *Hohenkerk* in *Forest Dept.* no 812A.

Vernacular names, *itikiburaballi* and *kerunite* (Arawak).

Distr. At present known only from British Guiana.

A tall, cauliflorous, tree of wallaba (Eperua) forest, possessing—according to Hohenkerk—a firm to hard wood. Petal large, bright yellow. The long fruit was not mentioned in the original description, since *Forest Dept.* 812A had not been assigned to this species. It is up to 25 cm. long and 2 cm. wide, and is constricted between the numerous (6-14) seeds. The fruiting stipe is only about 1 cm. long. The surface of the fruit is rough and glabrous except for minute scattered scales and some large sessile plate-shaped glands.

3. **S. tomentosa** *DC.* Mém. Légum. 409, t. 59 (1825); Prodr. **2,** 423 (1825); Benth. in Mart. Fl. Bras. *l.c.* 34, quoad nomen tantum, excl. descr.—*Robinia panacoco* Aubl. Hist. Pl. Guiane, 768, t. 307 (1775) quoad folium tantum. *R. tomentosa* Willd. Sp. Pl. **3,** 1134 (1803) quoad folia. *Swartzia similis* R. Benoist in Bull. Mus. Hist. Nat. Par. **25,** 297 (1919).

Foliola subtus sublanato-canescenti-tomentosa. *Bracteae* parvae, 1-2 mm. longae. *Pedicelli* longiores ad 1·2 cm. longi. *Alabastra* matura ad 8·5 mm. longa, ad 7·5 mm. lata. *Filamenta* longiora glabra. *Gynoecium* omnino glaberrimum; ovarium circiter 8 mm. longum, 1·5–2 mm. latum; stipes ad 1·2 cm. longus; stylus ad 9 mm. longus.

French Guiana. Banks of R. Cabassou, etc., *Patris* (typus in Herb. Candoll., Geneva). Without locality, *Aublet* (Herb. Mus. Brit.); ? coll. *Aublet* (Herb. Jussieu in Herb. Paris.). Without locality, *Perrottet* (Herb. Candoll., Geneva). Without locality, *Martin* (Herb. Paris., Kew.).

var. **Altsoni** *Sandwith*, var. nov.; a *S. tomentosa* typica foliolis subtus ferrugineis potius quam canescenti-tomentosis, bracteis alabastrisque majoribus, praesertim ovario atque stipite dense albido-tomentoso differt.

Bracteae conspicuae, late ovato-concavae, 3·5–8·5 mm. longae. *Pedicelli* longiores ad 1·8 cm. longi. *Alabastra* matura 1–1·2 cm. longa, 0·9–1·1 cm. lata. *Filamenta* longiora glabra. *Ovarium* ad 1 cm. longum, 3-4 mm. latum, stipite ad 1·1 cm. longo; stylus basi excepta glaber, ad 8 mm. longus.

British Guiana. In forest bordering savannah, near Paramacutoi Savannah, Ireng District, 760 m., fl. May 1926, *Altson* 528 (typus in Herb. Kew.; dupl. in Herb. Novoebor.): a small tree, 30 ft., high; inflorescences arising from old leafless branchlets; petal yellow, crinkled; stamens orange; ovary green, covered with silky-white tomentum.

Vernacular name *carwai-yek* (Patamona).

var. **Sagoti** *Sandwith*, var. nov.; a *S. tomentosa* typica foliolis subtus ferrugineis dense pubescentibus tantum nec sublanato-canescentibus, filamentis longioribus pilosis, praesertim ovario atque

stipite dense albido-tomentoso subsericeo differt.—*S. tomentosa* Benth. *l.c.* partim quoad descr., non DC.; R. Benoist in Archives de Botanique, **5,** mém. i, p. 126 (1931).

Bracteae satis parvae, ad 3 mm. longae. *Pedicelli* longiores ad 2·7 cm. longi. *Alabastra* matura ad 9 mm. longa, ad 8 mm. lata. *Filamenta* longiora pilosa. *Gynoecium* plus minusve ut in var. *Altsoni*, ovario lato atque stipite subsericeo-tomentoso.

French Guiana. Karouany, 1857, *Sagot* 161 (typus in Herb. Kew.; Herb. Mus. Brit.; Herb. Paris.).

var. **polyanthera** (*Steud.*) *Sandwith*, var et comb. nov.; a *S. tomentosa* typica foliolis subtus pubescentibus tantum, filamentis longioribus pilosis, praesertim ovario subsericeo-albido-tomentoso differt; a var. *Altsoni* atque var. *Sagoti* ovario paullum angustiore, stipite glabro, statim distinguitur.—*S. polyanthera* Steud. in Flora, **26,** 757 (1843). *S. tomentosa* Benth. *l.c.* partim quoad descr., non DC.

Bracteae satis parvae, circiter ad 2·5 mm. longae. *Pedicelli* longiores ad 1·8 cm. longi. *Alabastra* matura ut in var. *Sagoti*. *Filamenta* longiora pilosa. *Ovarium* circiter 1 cm. longum, 2·2–2·8 mm. latum.

Surinam. Without locality, *Hostmann* 1267 (type no., Kew).

The above treatment is offered as a provisional solution, based on present evidence, of the difficulties arising from the nomenclature and taxonomy of this species. Aublet described and figured his *Robinia panacoco* from the leaves and stipules of a *Swartzia* and from the flowers and fruit of another genus, probably—as suggested by de Candolle—of a *Lonchocarpus*. Willdenow's description of *Robinia tomentosa* is partly an adaptation of Aublet's and partly based on his (Aublet's) figure, and there is no evidence that he suspected the composite nature of *Robinia panacoco;* the name *Robinia tomentosa* was therefore superfluous and illegitimate. It was de Candolle who first identified the leaves and stipules with those of flowering material of a *Swartzia* collected in French Guiana by Patris, and proceeded to name and figure the plant as *S. tomentosa* DC., and gave a description of the inflorescence in which, unfortunately, no mention was made of the presence or absence of indumentum on the gynoecium. As the vernacular name of Patris' tree was Bois Pagaye blanc, and not Panacoco, de Candolle reasonably rejected the name Panacoco for the species, and accepted Willdenow's epithet which applied to the *Swartzia* foliage. It is not clear whether de Candolle saw Aublet's dried material or merely matched Patris' specimens with the figure and description. At any rate he was correct, for the Patris foliage (kindly lent from Geneva) agrees excellently (particularly in the " duvet blanchâtre " of the lower surface of the leaflets) with that of two sheets collected by Aublet, and corresponding sufficiently to the figure and description of the leaves of *Robinia panacoco*, in the British Museum Herbarium. The name *Swartzia*

tomentosa DC. should therefore be accepted for this foliage, but the Patris collection should be regarded as the type of the species dating from 1825, *Robinia panacoco* Aubl. being treated as a *nomen confusum* and *Robinia tomentosa* Willd. as an illegitimate name.

Unfortunately, de Candolle's correct interpretation of the leaves of Aublet's species failed to fix the identity of *S. tomentosa*, for it has been misinterpreted by subsequent writers who did not examine either Aublet's or Patris' specimens and who therefore were ignorant of two important characters present in this material, namely the whitish or greyish woolly-tomentose lower surface of the leaflets of both collections, and the completely glabrous gynoecium of Patris' plant. The former character was mentioned by Aublet, while the latter might reasonably have been inferred from de Candolle's figure. Thus Bentham in the Flora Brasiliensis described the leaflets of *S. tomentosa* as rufous-tomentose beneath, the longer filaments as pilose (they are glabrous in Patris' material) and the ovary as densely sericeous-villous. His description was based on a Pohl specimen from Brazil, which has not been seen, on the French Guiana plant collected and distributed by Sagot as *S. tomentosa*, and on the Surinam Hostmann collection which had been described in 1843 as *S. polyanthera* Steud. More recently M. Benoist has described a new species *Swartzia similis* which he distinguishes from *S. tomentosa* by its glabrous ovary. M. Benoist's type collections, a duplicate sheet of one of which is at Kew, have been examined and they have the indumentum of the leaflets of Aublet's and Patris' specimens, and the inflorescence and gynoecium of the Patris type at Geneva. *S. similis* R. Ben. is therefore conspecific with *S. tomentosa* DC., and M. Benoist's *S. tomentosa* is the plant referred here to var. *Sagoti*.

As will be seen from the description of the above three varieties, the Sagot *S. tomentosa*, the Hostmann *S. polyanthera*, and Altson's collection from British Guiana, all differ from typical *S. tomentosa*, which is now known from four collections, either in the colour or density of the indumentum on the lower surface of the leaflets, or in their gynoecium of which at least some part is densely whitish-tomentose, while in two of them the ovary is much broader. They also differ from each other in various ways, but until further collections prove a satisfactory repetition of these combinations of small differences, it seems wiser to treat all three as varieties rather than as independent species. Both pilose and glabrous long filaments are known in material of other species of *Swartzia*, and bracts might well be abnormally large in a single collection, while the densely tomentose ovaries and stipes of vars. *Sagoti* and *Altsoni* are connected with the completely glabrous gynoecium of typical *S. tomentosa* by var. *polyanthera* which has a glabrous stipe and a tomentose ovary. It may be mentioned finally that the var. *Sagoti* is apparently known in French Guiana as Panacoco, according to M. Benoist, see " Les Bois de la Guyane Française " in Archives de Botanique, **5**, mém. 1, p. 126 (1931).

4. **S. pachyphylla** *Harms* in Notizbl. Bot. Gart. Berlin, **6**, 310 (1915).

Roraima, in "Galeriewald" at 1400 m., fl. Dec., *Ule* 8618 (type collection) : tree, 10–15 m.; fl. yellow.

Distr. Only known from this collection.

This is so closely allied to *S. grandifolia* in essential characters that the possibility of its being a mere habitat form of that species must not be excluded. On the other hand, it may represent an old specific type from which the cauliflorous *S. grandifolia* has evolved.

5. **S. grandifolia** *Bong. ex Benth.* in Hook. Journ. Bot. **2**, 85 (1840) et in Mart. Fl. Bras. *l.c.* 25.—*S. Schomburgkiana* Klotzsch in Rich. Schomb. Reisen, **3**, 1208 (1848) nomen, fide ms. in sched. Rich. Schomb. no. 1441 in Herb. Berol.

Without locality, 1844, *Robert Schomburgk* 2nd coll. 838 (1441 B) ; Pomeroon River, Sept. 1843, *Richard Schomburgk* 1441 (Berlin). Cabalebo Falls, Corentyne River (perhaps in Surinam), fl. Sept., *Jenman* 116 and *im Thurn ;* tree 20 ft. high. Berbice-Rupununi Cattle Trail, fl. June, *Abraham* 215 (New York). Dense upland forest, Tumatumari, Potaro River, fl. June-July, *Gleason* 425 ; tree 40 ft. high. Arunamai Creek, Pomeroon River, fl. March, *Forest Dept.* no. 2280 : cauliflorous tree 72 ft. high, 5 in. diam., in Mora forest on sandy soil ; petal yellow with purple veins ; stamens purple at base, yellow above, lower bundle purple.

Vernacular name, *itikibouroballi* (Arawak).

Distr. Amazonian Brazil.

The leaflets of the above specimens are less hairy beneath than those of most Brazilian collections, but no varietal significance is here attached to this fact. The size of the buds and bracts and the position of the bracteoles also vary considerably in different collections.

6. **S. latifolia** *Benth.* in Hook. Journ. Bot. **2**, 86 (1840) et in Mart. Fl. Bras. *l.c.* 32.

Dry savannahs, Pirara, *Robert Schomburgk* 724 (type) : a tree 20–30 ft. high ; calyx greenish-yellow ; petal bright yellow ; filaments and anthers yellow. Banks of Takutu River, 1842, *Richard Schomburgk* 516 (Berlin). Without locality, ann. 1843, *Schomburgk* 534 (832B). Without locality, *Appun* 1781.

Vernacular name, *arararico* (Macusi), according to Robert Schomburgk, ms.

Distr. Rio Branco, Brazil.

The racemes arise in clusters from the old wood, and are rusty-tomentellous. The glabrous yellow petal is rather small, usually considerably less than 1 cm. long and broad, and the style is very short and obtuse. The leaflets have very short petiolules, are obtuse and rounded or very shortly and bluntly cuspidate at the apex, rounded and usually distinctly cordate at the base, while the lower surface is glabrate to rather densely pubescent.

7. **S. Schomburgkii** *Benth.* in Mart. Fl. Bras. *l.c.* 38.—*S. subspicata* Klotzsch in Rich. Schomb. Reisen, **3**, 1208 (1848), nomen.

Without locality, *Robert Schomburgk* 2nd coll. 894 and *Richard Schomburgk* 1422 (type). The last collection is also in the Berlin Herbarium and was gathered on the Pomeroon River in Sept., 1843; it is labelled *S. subspicata* Klotzsch. Bartica, fl. Nov., *Jenman* 4775. Mazaruni Station (H.M. Penal Settlement), fl. July, *Forest Dept.* no. 2294; fr. March, *C. W Anderson* 168. Mazaruni River, *Appun* 390; fl. Sept., *Jenman* 707. Waini River, North-west District, fl. Nov., *C. W. Anderson* 168A.

Vernacular name, *parakusan* (Arawak).

Distr. Only the above specimens have been seen, and no records have been found for localities outside British Guiana.

Usually a large tree with deeply fluted trunk, thus resembling the Arawak Yaruru (*Aspidosperma excelsum* Benth.). C. W. Anderson noted that the wood was similarly used for making paddles, and that it splits easily, being softer and whiter than that of Yaruru. T. A. W. Davis records it as locally plentiful in mixed forests by the Barama River, North-west District. As with so many species of the larger forest trees, small examples may be met with on river-banks, since *Jenman* 707 was recorded as only 20–40 ft. high.

The petal is pure white and fairly large, the lamina normally somewhat exceeding 1 cm. in length and 1·5 cm. in width. The 7–11 leaflets have a very fine pale scaly-scurfy indumentum on the loosely reticulate lower surface; this indumentum is similar in character and colour to that of the inflorescence. The ripe fruit is up to 6·7 cm. long and 2·2 cm. wide, with the stipe about 1·5 cm. long.

8. **Swartzia Jenmani** *Sandwith* sp. nov.; *S. Schomburgkii* Benth. affinis, inflorescentia necnon pagina foliolorum inferiore indumento duplici, et arcte lepidoto-furfuraceo et revera pilosulo pilis quam lepidibus multo longioribus, alabastris majoribus, ovario lanato-tomentoso, stylo breviore differt.

Arbor teste lectore magna; ramuli ut folii petiolus rhachis petiolulique et lepidoto- et pilosulo-pubescentes. *Stipulae* desunt. *Folium unicum visum* magnum, paripinnatum, 10-foliolatum; petiolus 5·4 cm. longus; internodia rhacheos 5–6 cm. longa; petioluli longi, 1·1 cm. longi; foliola oblonga vel ovato-elliptica, apice ad 1·2 cm. cuspidato-acuminata, basi in petiolulum abrupte acute cuneata, 10·5–17·5 cm. longa, 5·6–6·8 cm. lata, firme chartacea, supra glabra costa impressa nervis lateralibus venulisque obscuris pagina ubique dense ruguloso-verruculosa, subtus ubique densissime pallide lepidoto-tomentella praeterea satis sparse manifeste pilosula laxe reticulata nervis primariis utroque costae latere 8–9 sed secundariis numerosis parallelis fere aeque prominentibus. *Inflorescentiae* axillares; racemi ad 20 cm. longi, 2–3 mm. crassi, ubique densissime pallide pilosulo-subsericeo-tomentosi necnon indumento lepidoto minuto sub pilis fere omnino abscondito induti; bracteae ovatae,

parvae, circiter 1·2 mm. longae atque latae ; bracteolae medio pedicello vel supra affixae, bracteis similes ; pedicelli 6–9 mm. longi, vulgo 2·5 mm. crassi. *Alabastra* globosa, sub ruptione circiter 9 mm. diametro. *Calyx* in lobos 4 ad 9 mm. longos intus glabros fissus. *Petalum* satis magnum, colore ignoto, ungue ad 5 mm. longo, lamina late suborbiculari circiter 1·8 cm. longa 2-2·5 cm. lata oculo nudo omnino glabra sed revera venis extra dimidio superiore hic illic sparse obscure pilosis. *Stamina* glabra ; majora 2–4, filamentis satis gracilibus ad 1·8 cm. longis, antheris oblongis 1·5 mm. longis ; minora numerosissima, filamentis inaequalibus gracillimis plerisque 1–1·2 cm. longis, antheris 1 mm. longis. *Gynoecium* stipite glabro circiter 1·4 cm. longo ; ovarium oblongum, plus minusve falcatum, 7–7·5 mm. longum, 2 mm. latum, prope basin glabrum ceterum dense pallide lanato-tomentosum atque sub pilis lepidotum ; stylus glaber, ut videtur 6–7 mm. longus, apice obtuso, facile ruptus. *Fructus* non visus.

British Guiana. Upper Demerara River, fl. Sept. 1887, *Jenman* 4083 (typus in Herb. Kew.) ; a large tree.

Vernacular name, *parakusan* (Arawak), according to *Jenman*.

The evidence from this material of a distinct new species of Parakusan, closely allied to *S. Schomburgkii*, is of considerable interest. Further collecting will show whether the trunk is fluted, as one would suspect, and whether the petal is white. The venation and colour of the lower surface of the leaflets are extraordinarily similar to those of *S. Schomburgkii*, but a lens reveals the double indumentum which is even more remarkable in the inflorescence, where the dense woolly hairs for the most part conceal the scales which alone are present in *S. Schomburgkii*. The dense tomentum of the ovary is easily rubbed off and the style is quickly broken, so that these characters must be used with caution, but the ovary of *S. Schomburgkii* seems to be invariably glabrous.

9. **Swartzia roraimae** *Sandwith*, sp. nov.; *S. oblongae* Benth. affinis, foliis 5-foliolatis, foliolis conspicue acuminatis subtus ut rhachi dense lanato-pilosis, inflorescentiis rigidioribus dense fulvo-tomentosis, alabastris majoribus, petalo ovarioque majore differt.

Arbor ? parva, ramulis summis siccitate nigrescentibus dense tomentosis. *Stipulae* subulatae, 5–6 mm. longae. *Folia* summa tantum visa, 5-foliolata, satis parva, petiolo rhachi petiolulis dense lanato-tomentosis ; petiolus cum rhachi exalatus, 1–2 cm. longus ; internodium inter juga foliolorum 2–2·8 cm. longum ; petioluli 5–6 mm. longi ; foliola ovato-lanceolata, oblonga vel oblanceolata, apice conspicue acuminata, basi cuneata atque saepius acute attenuata, 6–9·2 cm. longa, 2·2–4 cm. lata, coriacea, supra nitida glabra, subtus dense adpresse lanato-pilosa, nervis lateralibus primariis supra a secundariis numerosis parallelis vix distinguendis, subtus prominentioribus circiter 8 sursum arcuatis, reticulatione intricata supra crassiuscula sed impressa subtus elevata sed in foliolis junioribus ob indumentum haud cernenda. *Inflorescentiae* apicem ramulorum

versus axillares, solitariae, pauciflorae, 5–10 cm. longae, rhachi 2–3 mm. crassa, ubique dense fulvo-villosulo-tomentosae, haud sericeae ; bracteae angustae, lanceolatae, 4–6 mm. longae, 1·5 mm. latae vel angustiores ; bracteolae ut videtur desunt ; pedicelli 0·7–1·6 cm. longi. *Alabastra* ovoideo-subglobosa, 1·3–1·5 cm. longa, 0·95–1·2 cm. diametro. *Calyx* demum in lobos 4 circiter 1·4–1·5 cm. longos intus glabros fissus. *Petalum* magnum, ungue 4–5 mm. longo, lamina orbiculari ad 2 cm. vel ultra (videtur ad 2·5 cm.) longa, ad 2·8 cm. lata, extra praecipue dimidio inferiore sparse longe pilosa. *Stamina* numerosissima ; majora pauca, filamentis circiter 1 cm. longis, antheris oblongis 2 mm. longis. *Gynoecium* omnino glabrum; stipes 8–9 mm. longus ; ovarium oblongum, plus minusve falcatum, 0·8–1 cm. longum, 4–5 mm. latum ; stylus brevis, incurvo-uncinatus, 2–3.5 mm. longus. *Fructus* non visus.

British Guiana. Roraima, 1500 m., Dec. 1884, *im Thurn*, Set A, no. 67 (typus in Herb. Kew.) ; Set B, no. 67 (Herb. Mus. Brit.).

This very distinct plant was listed by Oliver as *Swartzia*, sp. nov. in the account of Sir Everard im Thurn's Roraima expedition, see Trans. Linn. Soc. Bot. Ser. II. 2.273 (1887).

10. **S. oblonga** *Benth.* in Hook. Kew Journ. **2,** 238 (1850) et in Mart. Fl. Bras. *l.c.* 17.—*S. cappariodes* Klotzsch in Rich. Schomb. Reisen, **3,** 1104 (1848), nomen.

On the banks of mountain streams, fl. Oct.-Nov., *Robert Schomburgk* 548 (*Richard Schomburgk* 852). Presumably collected in the neighbourhood of Roraima.

Distr. No other record or collection has been seen.

11. **S. eriocarpa** *Benth.* in Mart. Fl. Bras *l.c.* 17 (1870).

Mazaruni River, *Appun* 334. Without locality, fr. July 1922, *F. L. Stevens* (New York).

Distr. No other records or collections have been seen.

12. **Swartzia oblanceolata** *Sandwith*, sp. nov.; *S. recurvae* Poepp. manifeste affinis, foliorum rhachi alata, foliolis infra reticulatis, inflorescentiae rhachi pedicellisque puberulis tantum vel fere glabratis, bracteolis minutis, alabastris glabris differt.

Arbor vel frutex ramulis glabratis vel minutissime puberulis crebre lenticellatis atque verruculosis. *Stipulae* anguste ellipticae, acutissimae, 1·1–1·7 cm. longae, ad 5 mm. latae. *Folia* haud magna, 5-foliolata vel summa 3-foliolata, fere omnino glabrata ; petiolus cum rhachi plus minusve distincte alatus, alis sub petiolulis dilatatis apicibus acutissimis terminatis ; petiolus 0·7–2 cm. longus ; internodium inter juga foliolorum 2·5–4·3 cm. longum ; petioluli 2–3·5 mm. longi ; foliola oblanceolata vel obovato-oblonga, apice breviter obtuse cuspidata, basi cuneata usque obtusa atque basi ipsa rotundata, 4·7–14·8 cm. longa, 2·7–6·2 cm. lata, tenuiter coriacea margine revolutis, supra nitidula glabra, subtus saepius glaucescentia minute adpresse pubescentia vel glabrata, utrinque intricate

reticulata, nervis primariis utroque costae latere 8–10 sed secundariis parallelis numerosis fere aeque prominentibus. *Inflorescentiae* apice ramulorum juniorum axillares et terminales, simpliciter racemosae et paniculatae ; racemi arcuati, ad 18 cm. longi, siccitate saepius nigrescentes, fere ubique satis obscure pubescentes vel glabrescentes, multiflori, rhachi 1·5–2·5 mm. crassa ; bracteae parvae, triangulari-ovatae vel triangulari-lanceolatae, saepe acuminatae, 1·2–2·5 mm. longae, ad 1·5 mm. latae, pubescentes ; bracteolae supra medium pedicellum similes sed minores angustiores ; pedicelli 0·8–1·3 cm. longi. *Alabastra* ovoidea, saepius apiculata, 8–10 mm. longa, 5–7 mm. diametro, siccitate brunnea vel nigrescentia, glabra, nitidula, manifeste costata. *Calyx* demum in lobos 3 reflexos glabros 4–7 mm. latos fissus. *Petalum* flavum, glabrum, ungue 2·5 mm. longo, lamina suborbiculari crassinervia 8–11 mm. longa 9–10 mm. lata. *Stamina* glabra ; majora pauca, ad 5, filamentis ad 1·2 cm. longis deorsum dilatatis, antheris breviter late oblongis 1·5 mm. longis ; minora numerosissima filamentis ad 7 mm. longis antheris elliptico-oblongis circiter 1 mm. longis. *Gynoecium* omnino glabrum siccitate nigrescens ; stipes 8–10 mm. longus ; ovarium obovoideo-oblongum, plus minusve falcatum, 5–6 mm. longum, 2 mm. latum ; stylus brevis, incurvo-uncinatus, vulgo 2·5 mm. longus. *Fructus* pyriformis, 3·5 cm. longus, vix 1·9 cm. diametro, stipite 1·5 cm. longo.

British Guiana. Lower Cuyuni River, above Matope Falls, fl. March 1931, *Aitken* in *Forest Dept.* no. 1090 (typus in Herb. Kew.) : shrub on river-bank, with single yellow petal. Demerara River : fl. June, *Jenman* 5038 ; Kara-kara Creek, fl. July, *Persaud* 73 ; Seba, fruct. Oct., *Persaud* 164. Potaro Railway Survey, fl. Feb., *Hohenkerk* in *Bot. Gard. Herb.* 8899 (Jenman Herb., Georgetown).

Vernacular name, *siribidani* (Arawak), according to Jenman and Hohenkerk.

13. **S. leiocalycina** *Benth.* in Mart. Fl. Bras. *l.c.* 28.

Essequibo, *Appun* 34 (type). Lower Cuyuni River, fl. Feb., *Forest Dept.* 1031, 1065. *Forest Dept.* 884, leaf material only, from the Mazaruni River, seems to be referable to this species ; and *Appun* 19, also from the Mazaruni River, is placed here provisionally in the absence of flowers and fruit.

Vernacular names, *wamara* and *unikiakia* (Arawak) ; " brown ebony," according to Appun.

Distr. At present recorded only from British Guiana.

Easily distinguished by the close rusty tomentum of the inflorescence in conjunction with the small, black, glabrous, apiculate buds. The tree seems to vary greatly in height ; wood specimens have been tested for thrust blocks.

14. **S. Benthamiana** *Miq.* Stirp. Surinam. Sel. 15 (1850) ; Benth. in Mart. Fl. Bras. *l.c.* 28 ; Sandwith in Kew Bull. 1931, 361.

Santa, Demerara River, fl. Dec., *C. W. Anderson* 123. In wallaba forest, Moraballi Creek, Essequibo River, fl. Oct., *Sandwith*

488 : tall tree, about 92 ft. high, 13 in. diam.; blaze with purplish-red juice ; petal and filaments pure white. Mazaruni River, fl. Sept., *Jenman* 762 ; a low tree. Kaieteur Savannah, Potaro River, fl. Sept.-Oct., *Jenman* 1048 ; tree several feet high.

Vernacular name, *itikiburaballi* (Arawak).

Distr. Guiana ; Amazonian Brazil and Colombia.

A perplexing and very variable species, forming a small tree on the savannahs and a large one in the wallaba forest consociation of the coastal rain forests. In the gapó of the lower Rio Negro, Brazil, it appears as a low bushy tree. The main taxonomic variations are to be sought in the degree of impression or elevation of the veins on the lower surface of the leaflets ; and in the dimensions of the various floral parts. Thus in *Sandwith* 488, from wallaba forest, the floral parts are peculiarly small, the calyx divisions being up to 5·5 mm. long, the petal up to 5 mm. long by 4·5 mm. wide, and the ovary only 2 mm. long by 1·5 mm. wide, with a very short style. The Kaieteur Savannah collection, *Jenman* 1048, presents a remarkably different appearance at the other end of the scale, the calyx divisions being up to 8 mm. long, the petal 7 mm. long by 7 mm. wide, and the ovary 4–5 mm. long by 2–2·75 mm. wide, with a longer style. Amazonian sheets show the small calyx divisions and small petal of *Sandwith* 488, while the ovary and style are larger. The Surinam type (*Kappler* 1929) has not been examined during the present investigation, and Miquel's description gives no indication of the dimensions of the floral parts. French Guiana material is variable, the calyx divisions of *Sagot* 1162 being about 6 mm. long and the ovary 4·5 mm. long by 2·5 mm. wide ; while a *Wachenheim* collection from Godebert, June 1921, has similar calyx divisions but the ovary is 3 mm. long by 2 mm. wide. It may be noted that Sagot matched his specimens with authentic material in the Paris Herbarium.

These variations, though occasionally presenting a facies which might appear significant to the superficial observer, seem to be mere variations in dimension which may be due to habitat, since all the essential characteristics of the species are maintained throughout the range ; it has not therefore seemed advisable to describe the large-flowered form from the Kaieteur Savannah even as a variety, especially as Miquel's Surinam type has not been examined.

Among the more obvious features of this species may be mentioned the intricate network of the impressed veinlets on the upper surface of the leaflets, which usually dry a dark lead colour above and are somewhat glaucous beneath ; the numerous many-flowered racemes of the compound inflorescence ; the shining pale yellowish-tawny, and finely sericeous indumentum of the pedicels and buds ; and the small white petal. The larger filaments are 2–4 in number and often show some scattered hairs, as do the claw and midrib of the outer surface of the petal.

15. **S. dipetala** *Willd. ex Vogel* in Linnaea, **11,** 173 (1837).—*S. dicarpa* Moric. ex Meissn. Gen. Comm. 68 (1838) ; Benth. in Mart.

Fl. Bras. *l.c.* 27. *S. microstylis* Benth. in Hook. Journ. Bot. **2,** 89 (1840).

Quitaro River, 1838, *Robert Schomburgk* 578. Without locality, 1843, *Schomburgk* 344 (508B). Pirara River, Rupununi Savannahs, fl. Nov., *Davis* in *Forest Dept.* no. 2253 : tree about 30 ft. high, 8 in. diam., forming a large bushy clump, growing in low bush fringing a creek in the savannah inundated during the rainy season ; flowers yellow.

Distr. Amazonian Brazil. Orinoco River, Venezuela.

Two petals have not been seen in any of the flowers of the above material, nor did Bentham find them ; but there seems to be no doubt that *S. dipetala* and *S. dicarpa* are conspecific, and *S. dipetala* was the earlier published name.

16. **Swartzia guianensis** (*Aubl.*) *Urb.* Symb. Ant. **5,** 365 (1908), descr. ex exemplis demerarensibus ampliata ; apetala, in serie *Tounateae* juxta *S. sericeam* Vogel ponenda, rhachi folii distincte alata, foliolis 5 tantum minus oblongis, ramulis rhachi folii inflorescentiisque haud rufo-tomentosis, alabastris minoribus cinereo-subsericeis, calyce intus haud villoso-tomentoso sed sericeo-pubescente differt ; a specimine typico Aubletiano foliolis subtus haud plumbeo-glaucescentibus adultis subtus costa excepta glabris differt. —*Tounatea guianensis* Aubl. Hist. Pl. Guiane, 550, t. 218 (1775). *Swartzia alata* Willd. SP. Pl. **2,** 1220 (1800) ; DC. Prodr. **2,** 424 (1825) ; Benth. in Mart. Fl. Bras. *l.c.* 30, in obs.

Arbor parva, ramulis summis gracilibus teretibus plus minusve glabratis haud lenticellatis. *Stipulae* obscurae, subulatae, 3·5 mm. longae, pubescentes. *Folia* magna, 5-foliolata; petiolus cum rhachi pubescens, distincte alatus, alis sub petiolulis dilatatis reticulato-venosis apicibus abrupte conspicue acute acuminatis vel semiaristatis ; petiolus 2·5–4 cm. longus ; internodium inter juga foliolorum inferius 4–7 cm. longum, superius sub foliolo terminali 2·5–5 cm. longum ; petioluli brevissimi, circiter 2 mm. longi ; foliola oblonga vel elliptico-lanceolata, apice longe acuminata, basin versus attenuata sed basi ipsa rotundata, jugi inferioris saepe minora ac a 6 cm. longa 2·4 cm. lata, cetera 9·5–22 cm. longa, 3·5–9 cm. lata, satis tenuiter chartacea, utrinque nitidula viridia vel subtus brunnescentia, juniora subtus copiose pubescentia, adulta fere omnino glabra costa utrinque praesertim supra minute puberula excepta, costa supra impressa subtus cum nervis primariis utroque latere circiter 12 prominente, rete venularum intricato utrinque prominulo conspicuo, praeterea nervis primariis marginem versus serie duplici vel triplici nervorum limbalium anastomosantibus. *Inflorescentiae* infra folia e ligno vetere orientes ; racemi flexuosi, 15–23 cm. longi, pluriflori, ubique tomentosi, rhachi 1·5–2·5 mm. crassa brunnea ; bracteae triangulari-lanceolatae, vix 2 mm. longae, basi ad 1 mm. latae ; bracteolae ut videtur desunt ; pedicelli 3–9 mm. longi. *Alabastra* subglobosa, haud apiculata, 5–7 mm. longa atque lata, cinereo-subsericeo-tomentosa. *Calyx* irregulariter rumpens,

demum in lobos 3–4 reflexos fissus, intus sericeo-pubescens. *Petalum* deest. *Stamina* majora juxta ovarium 2, filamentis crassis 3–4 mm. longis dimidio inferiore glabris superiore adpresse pilosis, antheris magnis crassis oblongis 3·2–4 mm. longis ; minora numerosissima, glabra, pluriseriata, filamentis 1·5–6 mm. longis, antheris minimis globosis. *Gynoecium* stipite tomentoso 2 mm. longo ; ovarium oblongum vel obovoideo-oblongum, trigonum, 4–5 mm. longum, 2–2·5 mm. latum, tomentosum ; stylus excentricus, brevissimus, vix 1 mm. longus, rectus vel ovario deorsum adpressus, glaber. *Fructus* non visus.

British Guiana. Near Arawak Matope Falls, lower Cuyuni River, in mixed forest on a small ridge between two creeks, July 1933, *Tutin* 404 : tree, about 45 ft. high, with black heart-wood ; sepals yellow-green ; stamens long and white. Near Oko Creek, Cuyuni River, March 1933, *Davis* in *Forest Dept.* no. 2342 : small tree about 50 ft. high, 4 in. diam. in mora forest ; cauliflorous.

This *Swartzia* belongs to an interesting group of species with apetalous flowers and 2 large stamens with long anthers and relatively short filaments. Other species of this group which are evidently allied to the present plant are the West Indian *S. caribaea* Griseb. and *S. trinitensis* Urb. Both of these species, however, have the calyx glabrous within, while *S. caribaea* has an unwinged leaf-rhachis, and *S. trinitensis* has smaller leaflets. *S. guianensis* (Aubl.) Urb. (*Tounatea guianensis* Aubl.; *Swartzia alata Willd.*) is represented in Herb. Mus. Brit. by three apparently mature leaves collected by Aublet. Aublet's material, as noted by de Candolle and Bentham, is densely minutely pubescent all over the lower surface except in small areas which have become glabrous, and glaucescent ; the apex of the lateral leaflets is abruptly cuspidate, while the lateral nerves leave the midrib at a rather more obtuse angle than do those of the leaflets of the British Guiana specimens. In spite of these small discrepancies, the facies and general characters of the leaves of the three collections are so similar that it seems preferable, on present evidence, to identify the British Guiana material with Aublet's species, and to give a complete description of this material.

To judge from the description, *S. Tessmannii* Harms, of Amazonian Peru, is also a member of this group. It appears to have an unwinged leaf-rhachis, much smaller and less reticulate leaflets than *S. guianensis*, and a shorter merely puberulous or subglabrous inflorescence with sparsely adpressed-pubescent calyx lobes.

Distr. French Guiana (*Aublet* in Herb. Mus. Brit.).

17. **S. arborescens** (*Aubl.*) *Pittier* in Journ. Wash. Acad. Sci. **11**, 157 (1921).—*Possira arborescens* Aubl. Hist. Pl. Guiane, 934, t. 355 (1775). *Rittera triphylla* Sw. *Swartzia triphylla* Willd.; Benth. in Mart. Fl. Bras., *l.c.* 22. *S. parviflora* DC. *S. aptera* Klotzsch in Rich. Schomb. Reisen, **3**, 1208 (1848) nomen, non DC.

Orealla, Corentyne River, fl. Oct., *Jenman* 251. Moraballi Creek, Essequibo River, fl. Oct., *Sandwith* 538. Macaw Falls,

Waini River, *Beckett* and *Kortright* in *Bot. Gard. Herb.* 8495. Without locality, *Schomburgk* 102 (175); *Richard Schomburgk* (Berlin, *S. aptera* Klotzsch ms.).

Distr. Guiana. Amazonian Brazil, Colombia and Bolivia.

A small tree of riverbanks with subulate stipules, 3–5 papery leaflets with a retuse acumen, a small golden-yellow petal, and yellow stamens. The gynoecium is glabrous. Bentham gives a misleading description of the androecium as he apparently did not notice the shorter, very slender, staminodial series which is always evident.

18. **S. alterna** *Benth.* in Hook. Journ. Bot. **2,** 89 (1840) et in Mart. Fl. Bras. *l.c.* 39.

Without locality, 1843, *Schomburgk* 293 (585).

Distr. Amazonian Brazil.

Further characterised by its short and slender inflorescence, the small flowers and the membranous calyx. Ducke notes it as a small tree, and Spruce described the petal as white.

Material of the following collections does not match that of any of the above species, but is too incomplete for satisfactory identification or description: *Jenman* 4126, fr. Sept., Upper Demerara River, "Serrabadanny," a large timber tree; *Hohenkerk* in *Forest Dept.* no. 793, Eberobo River, Berbice River, fr. May, "Shebah-danni," with a hardwood used for house posts and spars (this may be *S. leiocalycina* or an allied species); and *Hancock* (near *S. Benthamiana*).

XLV—NEW ZEALAND VEGETATION.

In this review attention is directed to a series of three addresses delivered to New Zealand audiences during the present year by His Excellency, Lord Bledisloe, Governor General of New Zealand, on questions intimately affecting every individual in the dominion, and giving much food for thought to dwellers in other parts of the British Empire.

The first address was given before the members of the Auckland Travel Club on 7th June, and in this Lord Bledisloe, as a man of world wide travel, favourably compared the scenic effects of New Zealand with those of any other country he had seen. He said, "Before coming to New Zealand, I was able to say with sincerity and conviction that I knew of no country with a greater variety of scenic loveliness than Great Britain, no County in it that excelled Gloucestershire in this respect, and no district in that County more beautiful than that which contains my own ancestral home. But my views are now entirely altered. New Zealand can claim, without fear of contradiction, to possess a greater diversity of outstanding scenic attractiveness than any territory of similar area to be found anywhere in the world." He lamented the fact that many New Zealanders knew so little of the beautiful aspects of their own country and urged all who were able to travel throughout its length and

breadth. He went on to extol the value of New Zealand as a country for tourists, and how eloquently he did so can be estimated by the following extract.

"The average visitor to your shores has never heard of any tourist objective in this country other than Rotorua. There is no more fascinating health resort in the world than Rotorua. But what does he know of New Zealand who only Rotorua knows? Have you not in this Dominion the Empire's loveliest mountain in Mt. Egmont, the world's most beautiful glacier in Franz Josef, its most impressive Fjords in Milford, Dusky, and Queen Charlotte Sounds, its most inspiring group of snow-clad mountain peaks in your Mt. Cook range, lakes lovelier than those of Switzerland in Otago and Westland (not to mention South Auckland), glow-worm caves which rival those of Slovakia, thermal wonders comparable with those in Yellow-stone Park in America, and vistas of incomparable charm such as those which feed the eye from the heights of Mt. Tongariro, from the hills on the Waitangi Estate, looking out over your lovely Bay of Islands, or from the top of Paekakariki Hill over-looking Kapiti Island and the curving foreshore of the historic coast which faces it? What rivers in the wide world—even including the Rhine, the Dart and the Wye—can rival your Whanganui River amid its sylvan glory mirrored in its peaceful pools? Where, too, in the world can finer native bush be found than that which you possess, where grander giants of choice timber (so far as the ruthless woodman's axe has spared them) than those in Waipoua Forest, or where birds with more melodious song than your tui, and your bell-bird, or with more splendid plumage than your kaka, your pukeko or your kiwi? What country outside Britain can show better high roads for motor travel, or a greater choice of exceptionally good sport, obtainable at small expense? What other country has such alluring sun-bathed, flower-decked, winter resorts (comparable with the French Riviera, Madeira or Teneriffe) as Nelson in the South Island, Tauranga on the East Coast, or Paihia or Russel in the Far North, of this Dominion? Is there any country where the clear atmosphere and actinic light are more favourable to successful photography?"

On July 31st he gave the second address at the Annual Meeting of the New Zealand Forestry League at Wellington, his subject being New Zealand's Timber, a Great National Asset. After referring to the League and its activities, he remarked upon the apathy in the past of the people of the British Isles with regard to Forestry, and gave figures indicating the vast amount of money expended annually with foreign countries upon timber, instancing how a considerable quantity of the timber purchased might have been grown in Great Britain. He also drew attention to the steps now being taken through the Forestry Commission of establishing forests in various parts of the home country. He then passed on to New Zealand's timber supply and the steps that were being taken not only to produce all the timber required in the country but to

provide a surplus for export. State forestry plantations in New Zealand, he stated, had " already attained an area of 396,000 acres, while those under other control aggregated 263,000 acres." Attention was drawn to the fact that these new forests were formed very largely of exotic species, the 396,000 acres of State forests including *Pinus radiata* (*insignis*) 180,000 acres ; Corsican Pine 49,000 acres ; Larch 8,000 acres ; Western Yellow Pine 38,000 ; and Douglas Fir 40,000 acres. Great stress was laid upon the necessity for training the young to a tree sense, and enabling them to realise the importance of trees to human life not only from a commercial point of view but also from an aesthetic view point. Lord Bledisloe drew attention to the changes that were going on in plant life, instancing how one kind of tree was undergoing considerable natural increase whereas other native species were in danger of extermination, the change frequently being started by the clearance of ground through forest fires. In a review of forest conditions he said " The truly Primitive Plant Communities of this Dominion are those which came into existence in the absence of man and also in the absence of all grazing and browsing animals—a condition unknown in any other part of the world. In the opinion of the late Dr. Cockayne, the study of that great class of New Zealand Rain Forest (a tree community dependent mainly on frequent and heavy rainfall) is a peculiarly difficult task for the scientific forester, owing to the slow but constant changes which are always in progress, new combinations of plant and timber growth coming into being only to pass away and gradually give place to other combinations. To use his own apt expressions, the study is not static but dynamic, full of absorbing interest to the ecological botanist and of perplexity to the forester, however well trained he may be. The changes which, unaided by man, take place in a primitive forest he describes as 'successions.' Humanly unaided mutability, in the form of successions, gives place gradually, but ultimately, to apparent stability. There is then formed what he calls a 'climax community' in forest growth. In the North Island, he speaks of the climax community as being dominated principally by the Tawa, but in the Far North frequently by the Taraire, and the principal trees—the kauri and the podocarps (Totara, Kahikatea, Miro and Matai)—as merely successions, and (although powerful to reinstate themselves, albeit in dwindling numbers) as being doomed ultimately to be replaced by a broad-leafed dicotyledonous tree community. In the South Island and Stewart Island he considered that the climax community was slower to come into being, but his opinion was that the podocarp community would finally be replaced by a climax with the Kamahi (Weinmannia racemosa) dominant. The cause of the incoming and final control of the climax community is that its tall trees are tolerant of shade, whereas the kauri and the podocarps demand for their proper development a considerable amount of light and also the absence of strong winds. If the above theories be reliable (and no greater authority on such subjects than Dr. Cockayne has the

Empire yet produced), the scientific forester should be able to devise plans for increasing the life of the kauri and podocarp successional communities. His main concern will be the question of how much expense may be incurred, particularly in the matter of eliminating such forest species as shut off the light. Generally, however, rain forest proper is now on ground unsuitable for farming, and the forest covering of such ground, when the economically valuable trees have been removed by the sawmiller, can be left to itself in the confident hope that there will be a considerable regeneration of the podocarp, and thus the exploited forest will once more become of economic value. It seems not unlikely that the forestry procedure of the future will be careful preservation of milled State forests or indigenous timber and their protection against the danger of fire and of browsing and grazing animals. The only possible objection to such a plan from a purely monetary standpoint is that the time factor and compound interest may be deemed to render it uneconomic. But it seems unfair to impose upon this, the most difficult of all long-term human enterprises, the burden of an unvarying compound interest rate, inapplicable to other industrial undertakings with a more rapidly recurring output. A compromise (somewhat repugnant to aesthetic taste and a sense of fitness—like putting new wine into old bottles) would be the introduction of a scattered intermediate crop of suitable shade-tolerant exotic conifers (excluding all species of the genus *Pinus*) which can be removed at a comparatively early date, say after 60 years, and thus made to pay for further assistance to the young podocarp crop in its struggle against the natural climax community."

The suggestions made by the Governor General for fostering a love of nature in children are worthy of repetition, he said " I must congratulate the League on having organised competitions in the collecting of indigenous plants by school children, for I am sure that they will stimulate the rising generation to appreciate the wealth and beauty of their native flora. But the mere unintelligent collection of plants without their individual identification is of small value in developing that most valuable human equipment—a capacity for accurate observation—or indeed in stimulating a pride in, and love of, the treasures of the forest, with which Nature has so bountifully endowed their native land. But please don't insist on young children using Latin names in this process of identification ; they are often ill-spelt, seldom accurately pronounced, and probably never remembered. For the expert botanist and for variety distinction this no doubt is necessary. But, for the ordinary school child, should not either the English or the Maori name suffice, particularly the latter, where one is available ? For instance, is not ' Rangiora ' more beautiful, and indeed more pronounceable than ' Brachyglottis repanda ' or ' Tawa ' and ' Taraire ' than ' Beilschmiedia ' ? Moreover, the scientific nomenclature of plants is constantly changing. For example, what were but yesterday known as Sophora, Veronica and Lomaria (fern) are to-day respectively

Edwardsia, Hebe, and Blechnum. Are not such popular names as Kowhai, Koromiko and Piu-piu adequate for our children's use and more likely, in an atmosphere of romantic Maoridom, to be memorised, conversationally employed and permanently correct? What prettier name could there be for one of New Zealand's commonest and loveliest flowers than 'Koromiko'? The Maori names for flowers and trees are surely amongst the most beautiful in the world. Should not your nation's children be familiar with them? These juvenile native plant competitions and the commendable policy of the League in giving prizes to school-children for essays on the values of forests will in due course substantially augment the number of zealous and active supporters of forest conservation in this Dominion."

From a botanist's point of view possibly his third address on the "Glories and Peculiarities of New Zealand Forest Vegetation" makes the greatest appeal of the three. It was delivered at Wellington College on Arbor Day, August 1st. He began by alluding to the beauty of the rural scenery of England, instancing how much was due to the "abundant presence of such trees as oak, ash, elm, beech, maple and sycamore," and to the fact "that her rural boundaries are usually live hedges (bedecked sometimes with may-blossom, honeysuckle, hips and haws, sloes and holly berries) rather than, as is common here [New Zealand], post-and-wire fences." He went on to recommend Dominion farmers to emulate others who have "prudently planted trees for wind breaks and for beautification of their homes," saying "there are many areas where trees are noticeably far too scarce." In speaking of New Zealand trees, he said, "To the tree lover coming from the Old Land the most marked distinction between the trees of Great Britain and those of this Dominion is that the former are mostly deciduous (that is to say, they lose their leaves in winter) and the latter are nearly all evergreen. Moreover, to an extent unparalleled in any other territory of similar area in the world, New Zealand's trees are her own exclusive property. They are true 'New Zealanders,' for at least 89 per cent. of them are to be found in no other part of the globe. No country in the world has been more luxuriantly clothed by Nature than New Zealand. In few, if any, have the beauty and permanent value of her natural vestment been so inadequately appreciated or treasured by past generations of its human population. The more that the naturalist pries into the mysterious treasure-house of her hitherto unspoilt natural vegetation the more thrilled with wonderment and delight does he become. Nature with a bounteous profusion has indeed robed this highly-favoured land with a mantle of verdure which is of most remarkable beauty, and in this vegetation there are several species of trees and other plants which for graceful form, beauty of flower, delicacy of foliage, or imposing stature, are unsurpassed anywhere in the world. What country can display within the same area woodland products comparable in these respects with your Rimu, Pohutukawa, Puriri,

Totara, Black Tree-fern (or Mamaku), or the noble Kauri? If it be considered only from the utilitarian or commercial standpoint, your scenery (which is enhanced materially by the beaty of your native trees) is one of your most valuable assets, for it is a magnet which already attracts many visitors from overseas, and the tourist traffic which it stimulates is bound to increase to such proportions that it will be in the future one of the major business activities of the country. Do all in your power to keep your scenic reserves and national parks, so far as is still practicable, in their virgin and natural condition, for their interest and attraction are greatly diminished when exotic plants and animals are introduced into them.

" As one travels through this naturally beautiful land one cannot but regret that commercial competition is responsible for the frequent erection of advertisement hoardings, which are incongruous and repellent blemishes on the loveliness of the landscape. I earnestly hope that it will gradually come to be recognised, in view of the growing resentment among nature lovers and motorists against these scenic disfigurements, that the path both of patriotism and of commercial wisdom lies in their discontinuance, at least outside the confines of your towns.

" In appealing to you—on Arbor Day, 1934—to love trees, to study trees, to plant trees and to preserve trees (especially those which harbour and attract your all too scarce but melodious and beautiful birds) I want to stimulate your imagination—in these days of ' records ' (on racing tracks, on cricket fields, in the air and elsewhere)—by referring especially to some of the peculiarities of your New Zealand vegetation, including its forestal equipment, which help to make it intriguingly distinctive by comparison with that of other parts of the world. New Zealand, fortunately, cannot boast climatically of extremes of heat and cold, in spite of your occasional inexorable gales its climate is most equable and health-giving. (Incidentally ' Windy Wellington ' can boast of the lowest recorded death-rate of any city in the world). But in plant life it revels in extremes. It has the largest tree in the world in the Kauri (one specimen on the Tutamoe Range, near Dargaville, with a girth of 66 feet, having contained 31,416 cubic feet of timber) and the smallest pine in the world, the pygmy pine (Dacrydium laxifolium), of sub-alpine areas, the height of which is normally about twelve inches, but in exposed sites no more than two. It has the world's largest lily in the cabbage-tree (Cordyline australis), a specimen of which at Taihape proved on measurement to be 18 feet in girth. It has the erroneously called, but very lovely, ' mountain lily ' (Ranunculus Lyallii) the largest buttercup in the world. In Pahau-Kakapo (Dawsonia superba), which is confined entirely to New Zealand, it has the tallest moss in the world, attaining, as it does, a height of two feet or more. In the sea-serpent kelp (Macrocystis Dubenii) it possesses the largest sea-weed in the world, which sometimes reaches to a length of two or three hundred feet. It has in the Mahoe (Melicytus ramiflorus) a violet which is a tree,

and attains a height of 30 feet, and a forget-me-not (Myosotidium nobile) with leaves as large as those of a rhubarb. It has, moreover speedwells or veronicas which in England are modest little blue flowers barely showing their heads amid the herbage of the pastures, but which here in New Zealand are not only an enormous family of numerous species with a range of colours varying from white to dark purple, but in the form of shrubs and trees (known as ' Hebes '), reach a height of 40 feet. Amongst the daisies, it possesses trees which are 30 feet high, and the wood of some of them is so remarkably durable (rendered so by a fragrant oil) that the Maoris called them ' Ake,' which means ' for ever ' or ' eternal.' Included among the daisies is the beautiful New Zealand Edelweiss (Leucogenes) which is found in no other country, and reaches the consummation of its beauty in the Lion's Foot (Leucogenes leontopodium) with as many as fifteen flower-heads congested into a densely compacted cluster surrounded by 10 to 20 lovely snow-white woolly bracts, the leaves of the plant with a surface of silvery down forming a rosette at the base of the flower stalk. Dr. Leonard Cockayne, our late deeply-respected neighbour and world famous botanist, regarded this, I am told, as New Zealand's most beautiful plant. It is, moreover, a member of the daisy family which furnishes New Zealand with the strangest curiosity of her native vegetation. Not content with the world renowned ovine products of her farms and hill-stations, she possesses ' Vegetable Sheep ' (species of Raoulia and Haastia) to be found on the shingle slips of the South Island mountains. These plants form large hummocks which are sometimes 6 feet long and 3 feet wide. They have a thick, stout, woody main stem and powerful roots which penetrate the underlying rock crevices. Their branching stems are covered at their extremities with very small, woolly, tightly-packed leaves, and forming, as they do, a tight convex mass, exactly resemble at a distance recumbent sheep. The most distinctive of these plants (Haastia pulvinaris) is found only in New Zealand and is one of the world's most famous vegetable freaks. New Zealand's bean crop is not confined to her vegetable gardens, for amongst her most lovely trees she revels with justifiable pride in her resplendent Kowhai (Sophora or Edwardsia) with its dazzling golden blossoms, which in favourable situations can boast of a height of 50 feet, with a bole 3 feet in diameter. Its nectar is beloved of the Tui (our New Zealand nightingale), and its ornamental timber, were it not for the exhaustion of its supply for fencing posts and firewood, would be of high value for decorative furniture. In the carrot and parsnip family (Umbelliferae), New Zealand can claim, without boasting of the fact, the world's most curious and uncomfortable specimen in ' the Spaniard ' or ' spear-grass ' (Aciphylla), some species of which are 6 feet high and have hard stiff leaves terminating in sharp spines, capable of penetrating the thickest sartorial integument and drawing human blood. The numerous clusters of its flowers are ensconced behind a veritable ' chevaux de frise ' of these spines. In the turnip and cabbage family (Cruci-

ferae) there is a genus found only in the mountains of the South Island of this Dominion and known as Notothlaspi. One variety (rosulatum), popularly called the ' pen-wiper plant ' is very peculiar. Its plentiful leaves are like a chemist's spatula and clothed, when young, with white ribbon-like hairs, and imbricated to form a rosette, from which springs a thick stalk carrying numerous sweetly-scented flowers. Another plant of the same family (Lepidium oleraceum), which is strangely unbeautiful, possesses what is known as anti-scorbutic properties and is historically famous as having been used by Captain Cook as a cure for scurvy amongst his sailors. He gained, as you are no doubt aware, great credit among navigators for the comparative freedom of his crews from this devastating malady, which added so materially to the perils of long-distance voyages in the eighteenth century. The little weed called groundsel (Senecio), with which we feed our caged canaries in England, takes the form here of 20 different shrubs of considerable size and extreme beauty, both of leaf and of flowers, which vary in colour from white to dark yellow. They would be a source of joy and cheerfulness in any English garden shrubbery.

" Among other peculiarities of the New Zealand native bush are the numerous trees — eighteen in number, apart from the shrubs — whose adult and juvenile foliage are markedly different from each other. They include the Lancewood (or Horoeka), the Matai, the pokaka, the Kowhai, the Kahikatea, and the Kaikomako. The Lancewood is the most extraordinary of all, having four differently-shaped leaves at different stages of its growth."

Further descriptions of native vegetation follow and throughout the whole of the three addresses the hearers cannot fail to have been impressed by the intense love of Nature shown by Lord Bledisloe, and his great aptitude for conveying his thought to others in delightful and convincing language.

Lord Bledisloe on several occasions expressed his indebtedness and great appreciation of the help he had received from the late Dr. Leonard Cockayne, the renowned New Zealand botanist, and from Mr. E. Phillips Turner, a man equally well known in connection with New Zealand forestry ; in both cases he paid high tribute to their work for the Dominion.

W. DALLIMORE.

XLVI—ON A COLLECTION OF ORCHIDS FROM THE SOLOMON ISLANDS. C. E. Carr.

The present paper deals with the orchids collected by Mr. J. H. L. Waterhouse in the islands of New Georgia and Bougainville in the Solomon Is. from 1929 until 1933.

The collection comprises 45 species belonging to 32 genera. Of these, 2 species, **Dendrobium Waterhousei** *Carr* and **Diplocaulobium solomonense** *Carr* are new to science. Four new combinations are made, namely **Desmotrichum thysanochilum**

(*Schltr.*) *Carr*, **Diplocaulobium araneola** (*Schltr.*) *Carr*, **D. arachnoideum** (*Schltr.*) *Carr* and **D. fariniferum** (*Schltr.*) *Carr*.

Only 6 species are endemic, while the fact that 32 species are common to New Guinea illustrates the close relationship of the orchid flora with that of the mainland.

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Eurycentrum salomonense *Schltr.* in K. Schum. et Laut. Nachtr. 90, t. v B. (1905).

Duke I., August 15th, 1929, No. 288. Native name : *Buburu Zimiri*.

Distrib.—Endemic.

Vrydagzynea salomonensis *Schltr.* in K. Schum. et Laut. Nachtr. 86 (1905).

New Georgia, May 21st, 1929, No. 26.

Distrib.—Endemic.

Tropidia ? disticha *Schltr.* in K. Schum. et Laut. Nachtr. 94 (1905).

Bougainville, Iru, September 28th, 1931, No. 557. Native name : *Tukurutukuru*. Bougainville, Siwai, September 30th, 1930, No. 287. In both numbers flowers are lacking.

Distrib.—N. Guinea.

Corymborchis veratrifolia *Bl.* Fl. Jav. n. ser. **1**, Orch. 125, t. 42 E (1858).

New Georgia, August 5th, 1929, No. 225. Native name : *Sisiduru*. The leaves are employed by the natives in the preparation of medicines.

Distrib.—India, Java, Borneo, through N. Guinea to Samoa, Fiji and ? Australia.

Coelogyne asperata *Lindl.* in Journ. Hort. Soc. **4**, 221 (1849).

Bougainville, Siwai, January 15th, 1932, No. 672. " Flowers creamy with orange-brown marks." Native name (Tlop) : *Makapauna* . Bougainville, Siwai, September, 1932, No. 728.

Distrib.—Sumatra, Malay Peninsula, Borneo, N. Guinea.

Microstylis pectinata *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **19**, 29 (1908).

Bougainville, Siwai, September 30th, 1931, No. 291. " Flowers light violet ? colour." Native name : *Mengonirung* (*Eel's ear*).

Distrib.—N. Guinea.

Liparis condylobulbon *Rchb.f.* in Hamb. Gartenz. **18**, 34 (1862). *L. savaiiensis* Fleischm. & Rech. in Denkschr. Akad. Wien. Math. Nat. **85**, 255 t. 1, f. 4 (1910). *L. persimilis* Schltr. in Fedde, Repert. Beih. **1**, 206 (1914) ; Beih. **21**, t. lxxviii, fig. 286.

Bougainville, Siwai, July 30th, 1931, No. 171. " Flowers cream." Bougainville, Namatoa, 1500 feet, March 7th, 1932, No. 688.

Distrib.—Sumatra, Java, Borneo, Philippines, Celebes, N. Guinea, Samoa, Fiji.

Mediocalcar vanikorense *Ames* in Journ. Arn. Arbor. **13**, 136 (1932).

Bougainville, Siwai, Hita at 5000 feet altitude, October 26th, 1931, No. 619 A.

Distrib.—New Hebrides.

Mediocalcar alpinum *J.J.S.* in Bull. Jard. Bot. Buit. Ser. 2. **13**, 62 (1914).

Bougainville, Siwai, Hita at 5000 feet altitude, October 26th, 1931, No. 619 B. This was mixed with the preceding.

Distrib.—N. Guinea.

Agrostophyllum costatum *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **19**, 1 (1908).

Bougainville, Siwai, November 3rd, 1931, No. 626.

Distrib.—N. Guinea.

Glomera rugulosa *Schltr.* in Fedde, Repert. Beih. **1**, 287 (1914); Beih. **21**, t. cvi, fig. 396.

New Georgia, July 1st, 1929, No. 130. Native name : *Tupaida*.

Distrib.—N. Guinea.

Podochilus bimaculatus *Schltr.* in Fedde, Repert. Beih. **1**,328 (1914) ; Beih. **21,** t. cxviii, fig. 444.

Bougainville, Siwai, October 26th, 1931, No. 604. Native name : *Tukuritukuri.*

Distrib.—N. Guinea.

Appendicula bracteosa *Rchb. f.* in Seem. Fl. Vit. 299 (1865).

Bougainville, Iru (Mt. Area), September 9th, 1931, No. 562. Native name : *Togarupia.*

Very careful comparison is required of this and some of Schlechter's species from N. Guinea.

Distrib.—Samoa and Fiji.

Phaius amboinensis *Bl.* Mus. Bot. Lugd. Bat. **2,** 180 (1856), *var.* **papuanus** *Schltr.* in Fedde, Repert. Beih. **1,** 375 (1914) ; Beih. **21,** t. cxxxii, fig. 496.

Buka, Skobolan, April 30th, 1931, No. 48.

Distrib.—(type) Java, Celebes, Amboina, N. Guinea. (var.) N. Guinea.

Spathoglottis Vieillardi *Rchb. f.* in Linnaea, **41,** 85 (1877).

Bougainville, Siwai, July 30th, 1931, No. 162. Native name : *Tongoruha.* New Georgia, June 24th, 1929, No. 91. Native name : *Molamola.*

Distrib.—Banda Is., New Hebrides, New Caledonia.

Pseuderia similis *Schltr.* in Fedde, Repert. Beih. **1,** 644 (1914). *Dendrobium simile* Schltr. in K. Schum. et Laut. Nachtr. 175 (1905).

Duke, August 10th, 1929, No. 253. Native name : *Totoa.*

Distrib.—N. Guinea.

Cadetia ceratostyloides *Schltr.* in Fedde, Repert. Beih. **1,** 424 (1914). *C. potamophila* Schltr. l.c. 438 : *Dendrobium ceratostyloides* J.J.S. in Nov. Guin. **8,** 50, t. xviii, fig. 57 (1909).

Bougainville, Siwai, November, 1932, No. 774. The number consists entirely of spirit material.

Distrib.—N. Guinea.

Dendrobium tumoriferum *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **39,** 11 (1910) ; et in Nov. Guin. **8,** 551, t. 88 B (1911).

Bougainville, Siwai, October 16th, 1931, No. 597.

Distrib.—N. Guinea.

Dendrobium Goldfinchii *F. Muell.* in Wing, South. Sci. Rec. **3,** 4 (Jan. 1883).

Bougainville, Siwai, September, 1930, No. 320. " Flowers white." Native name : *Tuku.* Bougainville, Siwai, August, 1931, No. 491. " Flowers creamy."

Distrib.—Endemic.

Dendrobium multifolium *Schltr.* in Fedde, Repert. Beih. **1,** 590 (1914) ; Beih. **21,** t. cxcvii, fig. 741.

Bougainville, Siwai, September, 1930, No. 340. " Flowers white."

Distrib.—N. Guinea.

Dendrobium cyrtosepalum *Schltr.* in K. Schum. et Laut. Nachtr. 169 (1905) ; et in Fedde, Repert. Beih. **1,** 597 (1914); Beih. **21,** t. cc, fig. 753.

N.E. Bougainville, Is. of Teop, April, 1932, No. 719. Native name : *Marapauna.*

Distrib.—New Ireland.

Dendrobium bilobum *Lindl.* in Hook. Lond. Journ. Bot. **2,** 236 (1843).

Bougainville, Siwai, June, 1931, No. 457. Native name : *Tuku.*

Distrib.—N. Guinea.

Dendrobium capituliflorum *Rolfe* in Kew Bull. 1901, 46.

Bougainville, Siwai, sine no. The material consists of a flowering stem in spirit.

Distrib.—N. Guinea.

Dednrobium fornicatum *Schltr.* in Fedde, Repert. Beih. **1,** 509 (1914) ; Beih. **21,** t. clxxiii, fig. 644.

Bougainville, Siwai, October 26th, 1931, No. 614. Native name : *Hita.* Flowers " very bright crushed strawberry and orange."

Distrib.—N. Guinea.

Dendrobium veratrifolium *Lindl.* in Hook. Lond. Journ. Bot. **2,** 236 (1843).

New Georgia, June 25th, 1929, No. 98. Native name : *Ubutu.* Flowers " white with mauve or lilac centre. Delicate scent."

Distrib.—N. Ireland, N. Guinea.

Dendrobium spectabile *Miq.* Fl. Ind. Bat. **3,** 645 (1855).

New Georgia, June 26th, 1929, No. 114. Native name : *Ubutu.*

Distrib.—N. Guinea.

Dendrobium (§ **Latourea**) **Waterhousei** *C. E. Carr,* sp. nov.; planta *D. punamensi* Schltr. et *D. euryantho* Schltr. affinis sed labello late cuneato lobo intermedio lobos laterales vix excedente carinis liberis altis apice haud confluentibus differt.

Rhizoma brevissimum. Caules approximati internodiis 4–6, cylindrici, apicem versus dilatati, canaliculati, usque ad c. 16 cm. longi, bifoliati. Folia oblongo-lanceolata, acuminata, acuta, membranacea, basi torta et subpetiolata, ad c. 18 cm. longa, c. 3·3 cm. lata. Inflorescentiae breves, pauciflorae, laxae, graciles, pedunculo c. 5·3 cm. longo, rachide c. 4·5 cm. longa. Bracteae pedicello adpressae, ovatae, acutae, c. 0·33 cm. longae. Sepalum dorsale oblongo-lanceolatum, brevissime acuminatum, acutum, c. 1·2 cm.

longum, c. 0·45 cm. latum. Sepala lateralia valde falcata, late ovata, breviter acuminata, acuta, c. 1·25 cm. longa, c. 0·9 cm. lata, margine antico in mentum cum ovario angulum rectum fere formantem c. 0·45 cm. longum producto. Petala oblongo-oblanceolata, brevissime acuminata, acuta, marginibus supra medium minute erosulis, c. 1·1 cm. longa, c. 0·4 cm. lata. Labellum unguiculatum, apicem versus 3-lobum, lamina supra unguem recurva late cuneata supra basin carinis 3 donata, carinis apicem versus valde dilatatis altis angustisque in $\frac{1}{4}$ parte sub apice labelli valde abrupte terminantibus, explanatum c. 1·25 cm. longum, trans lobos laterales c. 1·5 cm. latum, ungui oblongo concavo c. 0·3 cm. longo, lobis lateralibus ovatis obtusis parte libera c. 0·25 cm. longa, lobo intermedio brevissimo latissimoque lobos laterales paullo excedente reniformi apiculo subulato in sinu.

A plant of the affinity of *D. punamense Schltr.* and *D. euryanthum Schltr.* but with a very characteristic lip which is shortly clawed at the base, very broadly cuneate and shortly 3-lobed near the apex.

Bougainville, Siwai, September, 1930, No. 333 (type). Native name: *Tugorohia*, perhaps also *Togoruha*. Bougainville, Siwai, September, 1931, No. 590.

Described from dried material.

Desmotrichum thysanochilum (*Schltr.*) *C. E. Carr*, comb. nov. *Dendrobium thysanochilum* Schltr. in K. Schum. et Laut. Nachtr. 152 (1905); et in Fedde, Repert. Beih. **1**, 454 (1914); Beih. **21**, t. clii, fig. 571.

Bougainville, Siwai, August 1931, No. 490. Flowers "cream with dark purple to chocolate spots. Faint honey scent." Bougainville, Siwai, November 3rd, 1931, No. 627.

Distrib.—N. Britain, N. Guinea.

Diplocaulobium solomonense *C. E. Carr*, sp. nov.; planta *D. arachnoideo* (Schltr.) Carr proxima sed labelli lobis lateralibus distinctis, lobo intermedio truncato 3-lobulato differt.

Caules elongati, 1-nodii, apicem basinque versus leviter dilatati, lateraliter complanati et sectione elliptici, ultra 48 cm. longi (supra basin fracti), flavidi, 1-foliati. Folium lanceolato-oblongum, brevissime et levissime inaequaliter bilobum, superne canaliculatum, subtus costatum, coriaceum, ad c. 15.5 cm. longum, c. 2·2 cm. latum. Inflorescentiae apicales, fasciculatae, squamis numerosis cinctae et e vagina magna carnosa vix exsertae, uniflorae, pedunculo c. 1·1 cm. longo. Sepalum dorsale subulatum, subacutum, c. 2·3 cm. longum, basi c. 0·4 cm. latum. Sepala lateralia leviter falcata, subulata, subacuta, margine antico basi leviter dilatato, c. 2·2 cm. longa, basi c. 0·45 cm. lata. Petala lineari-lanceolata, acuminata, acutissima, c. 2·1 cm. long, c. 0·18 cm. lata. Labellum 3-lobum, omnino papillosum, intus supra basin carinis 2 donatum, carinis dimidio inferiore breviter denseque pilosis ceterum papillosis supra medium altis incurvatis vix contiguis sub sinu loborum valde

abrupte terminantibus dorsoque leviter productis, explanatum c. 0·7 cm. longum, c. 0·45 cm. latum, lobis lateralibus in $\frac{1}{3}$ sub apice labelli liberis parte libera brevi rotundata ; lobo intermedio subquadrato, basin versus leviter dilatato, apice truncato et brevissime 3-lobulato, marginibus dimidio superiore valde recurvatis, intus fascia lata e carinis usque ad apicem labelli producta bicanaliculata, c. 0·23 cm. longo. Gynostemium conicum, c. 0·35 cm. longum, alis bilobulis, pede cum gynostemio angulum rectum formante apicem versus leviter incurvato c. 0·45 cm. longo. Ovarium cum pedicello c. 3·5 cm. longum.

A very distinct species of the affinity of *D. nitidissimum* Kraenzl., *D. phalangium* Kraenzl., **D. araneola** (Schltr.) Carr (*Dendrobium araneola Schltr.*), **D. arachnoideum** (Schltr.) Carr (*Dendrobium arachnoideum Schltr.*) and **D. fariniferum** (Schltr.) Carr (*Dendrobium fariniferum Schltr.*). It is at once distinguished by the structure of the lip with the midlobe very short, truncate and minutely 3-lobed.

Bougainville, Siwai, in the more mountainous parts, September, 1930, No. 339. Native name : *Nah.* " The yellow stalks are much sought after for use in plaited armlets."

Described from dried material and flowers preserved in spirit.

Bulbophyllum sessile *J.J.S.* in Fl. Buit. **6,** 448 (1905) ; Atlas n. cccxl.

Bougainville, Siwai, October, 1930, No. 380.

Distrib.—Tenasserim, Andaman Is., Malay Peninsula, Sumatra, Java, Borneo, N. Guinea.

Thelasis elongata *Bl.* Fl. Jav. Orch. 23, t. 7, fig. 2 (1858).

Bougainville, Siwai, January 1933, No. 827 (spirit material only). Flowers " creamy white."

Distrib.—Malay Peninsula, Sumatra, Java, Philippines, Hong-Kong, N. Guinea, Admiralty Is.,

Phreatia brachystachys *Schltr.* in K. Schum. et Laut. Nachtr. 186 (1905) ; et in Fedde, Repert. Beih. **1,** 915 (1914); Beih. **21,** t. cccxx, fig. 1230.

Bougainville, Siwai, January 1933, No. 828 (spirit material only). Flowers " creamy white."

Distrib.—N. Ireland.

Phreatia Reineckei *Schltr.* in Fedde, Repert. **9,** 109 (1911).

Bougainville, Maisua, 1800 feet altitude, September 7th, 1931, No. 522.

Distrib.—Samoa.

Phreatia collina *Schltr.* in Fedde, Repert. Beih. **1,** 919 (1914); Beih. **21,** t. cccxxii, fig. 1239.

New Georgia, July 6th, 1929, No. 157. Native names : *Kikilapa, Ngirisi.*

Distrib.—N. Guinea.

Acriopsis Nelsoniana *Bail.* in Queensl. Agr. Journ. **3,** 160 (1898).
Bougainville, Maisua, September 9th, 1931, No. 535. Bougainville, Siwai, January 2nd, 1932, No. 668.
Distrib.—N. Guinea.

Grammatophyllum papuanum *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **14,** 11 (1911) ; et in Nov. Guin. **8,** 596, t. c, vii (1911).
Bougainville, Siwai, November 3rd, 1931, No. 622.
Distrib.—N. Guinea.

Grammatophyllum scriptum *Bl.* Orch. Arch. Ind. 48 (1848), *var.* **Boweri** *Schltr.* in Fedde, Repert. Beih. **1,** 951 (1914).
Bougainville, Siwai, November 3rd, 1931, No. 630. Flowers " liver colour with lighter markings."
Distrib.—N. Guinea.

Vanda Hindsii *Lindl.* in Hook. Lond. Journ. Bot. **2,** 237 (1843).
Bougainville, Siwai, October 20th, 1931, sine no. (spirit material only). Flowers " brown or liver colour, fringed or edged with cream.
Distrib.—N. Guinea.

Vandopsis Woodfordii *Schltr.* in Fedde, Repert. Beih. **1,** 972 (1914).
Bougainville, Siwai, November 3rd, 1931, No. 629. Flowers " creamy white with chocolate-red markings."
Distrib.—Endemic.

Renanthera Edelfeldtii *F. Muell. et Kraenzl.* in Osterr. Bot. Zeitschr. **44,** 460 (1894).
Bougainville, Siwai, October 26th, 1931, no. 616. Native name : *Papino Poku.* Flowers " rich brick red with dark markings."
Distrib.—N. Ireland, N. Guinea.

Ascoglossum calopterum *Schltr.* in Fedde, Repert. Beih. **1,** 975 (1914) ; Beih. **21,** t. cccxliii, fig. 1324.
Bougainville, Siwai, January 20th, 1932, no. 673. Native name : *Papino Poku.* Flowers " rosy pink " ; Bougainville, Siwai, no 320 (spirit material only).
Distrib.—N. Guinea.

Robiquetia Mooreana *J. J. S.* in Nat. Tijdschr. Ned. Ind. **72,** 44 (1912) ; Schltr. in Fedde, Repert. Beih. **1,** 984 (1914); Beih. **21,** t. cccxlvi, fig. 1335.
Bougainville, Siwai, October 1930, no. 374. Flowers " orange colour."
Distrib.—N. Guinea.

Schoenorchis densiflora *Schltr.* in Fedde, Repert. Beih. **1,** 986 (1914) ; Beih. **21,** t. cccxlvii, fig. 1339.
Bougainville, Siwai, November 1932, no. 777.
Distrib.—N. Guinea.

Camarotis papuana *J. J. S.* in Nat. Tijdschr. Ned. Ind. **72,** 28 (1912) ; Schltr. in Fedde, Repert. Beih. **1,** 992 (1914) ; Beih **21,** t. cccl, Fig. **1347.**

New Georgia, July 11th, 1929, no. 173. Native name : *Gora Goraha Ubutu.*

Distrib.—N. Guinea.

Trichoglottis papuana *Schltr.* in Fedde, Repert. Beih. **1,** 993 (1914); Beih. **21,** t. cccl. fig. **1349.**

Bougainville, Tlop, April 1932, no. 707. Native name : *Marapauna.* Flowers " creamy white with touch of purple in ' eye '."

Distribution.—N. Guinea.

XLVII—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS—XIII.* E. M. Marsden-Jones and W. B. Turrill.

Genetics of colour and indumentum of vegetative parts in S. vulgaris.

In this paper we deal with a cross and selfings made within the species *S. vulgaris* in order to test the genetical value of the peculiar " vivid green " colour of the vegetative parts of S.–P.16 (see K.B. 1931, 122) and to obtain further information concerning the genetics of indumentum. For this purpose S.–P. 16, a female plant, was used as the ovule parent and S.–P. 11 (for description of which see K.B. 1931, 121) as the pollen parent.

Selfing. S.–P. 16, being female, could not be tested by selfing but S.–P. 11 was selfed two years in succession. Unfortunately, the plant suffered very badly from *Marssonina* attack, to which it was very susceptible. As a result the seed obtained was very poor and only one seedling was raised. This one plant (N. 74) showed the following characters :—

Habit : stems erect, up to 5 dm. high, with medium anthocyanin in the vegetative parts, densely pubescent, plant hermaphrodite.

Leaves : up to 5·5 cm. long and 2 cm. broad, pubescent on both surfaces.

Inflorescence : with up to 30 flowers, more or less drooping. Bracts all ciliate, lower green, herbaceous, similar to uppermost leaves, ovate, acute, upper smaller and narrower and becoming scarious.

Calyx : ovoid, inflated contracted at apex, 1·3 cm. long, 1 cm. diam. with a trace of anthocyanin ; teeth equilaterally triangular, apex acute and apiculate.

Corolla : with petals divided $\frac{3}{4}$ length of lamina, segments and petals not overlapping or contiguous, petals 1·8 cm. long, 0·7 mm. broad, with a well-developed boss ; corolla diam. 1·9 cm.

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* Continued from K.B. 1933, 485.

Filaments : white ; anthers purple.

Immature seeds : white. *Stigmata*: white.

Ripe capsules : intermediate (I–II), 7 mm. long, 7·5 mm. diam., teeth 2 mm. long, erect ; month 2·5 mm. diam.

Carpophores : 2·5 mm. long, 2 mm. diam.

Mature seeds : tubercled.

F_1 generation.

N. 37. 14 plants in the family.

Habit : uniform, erect, with stems up to 8 dm. high, with little anthocyanin in vegetative parts, except in 2 plants which had a medium amount.

Surface of vegetative parts and calyx : mat for all plants.

Indumentum : dense for all plants.

Inflorescence : with up to 63 flowers.

Calyx : in all inflated, except in No. 5 which was subinflated, green, reticulately veined with a trace of anthocyanin.

Petals : in all plants ¾ lobed, no blotch, boss.

Filaments : (in all scorable plants with hermaphordite flowers) pink and anthers purple.

Sex : 7 plants ☿ : 3 plants ☿ and ♀ : 4 plants ♀.

Immature seeds : 8 pink : 6 white. *Stigmata :* 4 pink : 10 white.

Ripe capsules : 4 of Type I : 9 intermediate (I–II) : 1 Type II.

Mature seeds : of all plants tubercled.

F_2 generation.

Habit : uniform, with erect stems up to 7·4 dm. high in N. 75 and up to 8·7 dm. in N. 76, with foliage and inflorescence of typical *S. vulgaris* type.

N. 75. F_1 Plant 5 selfed. 44 plants in family.

Colour of vegetative parts : 1 plant with much anthocyanin : 34 with medium : 9 with little.

Surface of vegetative parts and calyx : 33 mat : 10 shining.

Indumentum : 31 dense : 13 glabrous.

Calyx shape : 2 inflated : 26 subinflated : 1 narrow.

Calyx colour : 12 medium : 18 little : 1 none.

Corolla : for all scorable plants ¾ lobing, boss, no blotch, petals and lobes not overlapping or contiguous.

Filaments : (in all scorable plants with hermaphrodite flowers) pink and anthers purple.

Sex : 1 ☿ : 4 ☿ and ♀ : 25 ♀.

Immature seeds : 17 pink : 1 white.

Stigmata : 18 pink : 12 white.

Ripe capsules : 11 Type I. : 22 intermediate (I-II).

Mature seeds : 30 tubercled : 5 weak armadillo.

N. 76. F_1 Plant 3 selfed. 89 plants in family.

Colour of vegetative parts : 14 much : 45 medium : 20 little : 10 none.

Surface of vegetative parts and calyx : 58 mat : 31 shining.

Indumentum : 60 dense : 13 medium : 1 few : 15 glabrous.

Calyx shape : 54 inflated : 13 subinflated : 0 narrow.

Calyx colour : 46 medium : 15 little : 8 none.

Corolla : for all scorable plants ¾ lobing, boss, petals and lobes not overlapping or contiguous. Blotch present in 2 plants only.

Filaments : 37 pink : 5 white ; anthers for all scorable hermaphrodite plants purple.

Sex : 36 ☿ : 6 ☿ and ♀ : 25 ♀.

Immature seeds : 48 pink : 2 white.

Stigmata : 31 pink : 32 white.

Ripe capsules : 20 Type I.: 37 intermediate (I-II) : 7 Type II.

Mature seeds : 37 tubercled : 26 weak armadillo : 1 armadillo.

Discussion.

All the plants considered in this paper are undoubtedly *S. vulgaris* and show the essential diagnostic characters of this species, such as hemicryptophytic habit, erect or ascending stems, and zygomorphic flowers. Each of the parents, and all plants of the F_1 generation and of N. 75 (F_2) had anthocyanin in the vegetative parts. N. 76 (F_2) gave the ratio 79 with : 10 without anthocyanin in the vegetative parts.

Surface of vegetative parts and calyx.

S.-P. 16 was recognized in the wild as a plant with peculiarly vivid shining green but glabrous vegetative parts. S.-P. 11 was a plant with non-shining dull green (mat) surface to the vegetative parts and the lower parts of the stems and the lower leaves densely hairy. The same gene or gene combination which is responsible for shining or mat surface in the vegetative parts is also responsible for the same kind of surface in the calyces. As in all plants of *S. vulgaris* with indumentum hitherto studied, this never extends above the last pair of foliage leaves (see K.B. 1931, 125) in any plant considered in this paper, apart from bract ciliations.

The breeding results for surface can be shown as follows :—

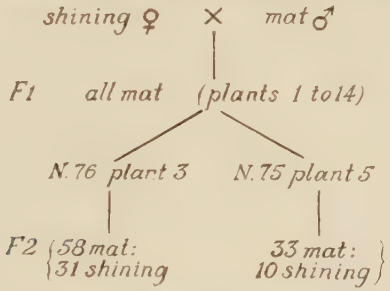

Fig. 1.

Mat is dominant over shining and in F_2 there is clear cut segregation in what probably indicates a 3 to 1 ratio.

Indumentum. Dense indumentum was completely dominant in F_1. In F_2 segration occurred as follows :—

No. 75 indumentum present 31 : indumentum absent 13

No. 76 „ „ 70 : „ „ 15

All plants of N. 75 with indumentum had this dense. 60 plants of N. 76 had dense indumentum, 13 had medium indumentum and 1 had very few hairs indeed. For presence versus absence the ratios approximate to 3 : 1 and 5 : 1 respectively.

There is no linkage, or none that is not frequently broken, between indumentum and surface type. The stock-plant parents were hairy and mat and glabrous and shining respectively, the F_1 hairy and mat, and in F_2 all four possible combinations occurred—hairy and mat (as N. 75. 15), hairy and shining (as No. 75. 18), glabrous and mat (as No. 75. 13), glabrous and shining (as N. 75. 34).

Calyx shape. The two parents had inflated calyces. The F_1 gave 13 inflated : 1 subinflated. N. 75 was obtained by selfing the subinflated F_1 plant; N. 76 by selfing one of the inflated F_1 plants, with the following results :—

N. 75	2	inflated	: 26	subinflated	: 1	narrow
N. 76	54	,,	: 13	,,	: 0	,,

The contrast between these ratios is marked and can undoubtedly be correlated with the calyx shapes of the immediate (F_1) parents. These figures seem to indicate that cumulative genes are necessary for the production of inflated calyx.

Calyx colour. Both parents and all F_1 plants had little anthocyanin in the calyx. The F_2 showed the following apparent segregation :

N. 75	12	medium	: 18	little	: 1	none.
N. 76	46	,,	: 15	,,	: 8	,,

Corolla. $\frac{3}{4}$ lobing, boss, and petals and lobes not overlapping were constant characters in all plants considered in this paper. There was no anthocyanin blotch in the parents, F_1, or N. 75, but 2 plants with blotch appeared in N. 76 together with 62 without blotch.

Filaments. The following diagram illustrates the inheritance of filament colour in the plants considered here :—

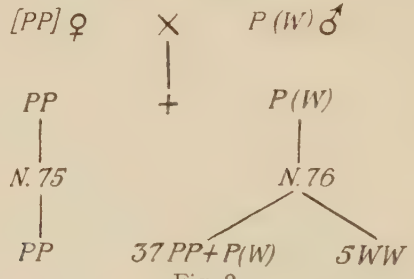

Fig. 2.

Stock-plant 16 was a female and was used as the ovule parent. Stock-plant 11, a hermaphrodite, was used in the pollen parent and must have been heterozygous for filament colour because while it had pink filaments its one offspring from selfing had white filaments. Since all F_1 plants had pink filaments stock-plant 16

was almost certainly homozygous for pink filaments, a character it could not possess. It also follows that the F_1 plants were approximately half homozygous and half heterozygous though all were phenotypically the same with pink filaments. One plant No. 5, used to produce F_2 (N. 75) was homozygous, since all its hermaphrodite offspring from selfing had pink filaments. The other, No. 3, used to produce N. 76, was heterozygous and segregated in a 7·4 : 1 ratio.

Anthers. These were purple in all plants possessing them from the parents to the F_2.

Sex. The following diagram indicates the results of our scoring :

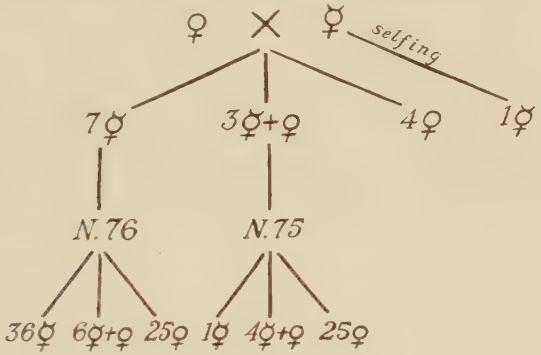

Fig. 3.

It may be noted that both ♀ and ♀ + ♀ plants have segregated on selfing to produce F_2 but in very different ratios, the former giving a predominant number of ♀ plants, the latter a predominant number of ♀ plants.

Immature seeds. The following diagram gives the results obtained :—

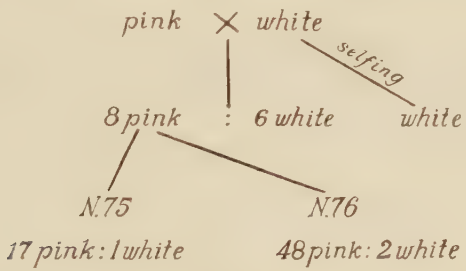

Fig. 4.

These figures suggest the action of cumulative and complementary factors but our data are as yet insufficient for more than a tentative interpretation (see K.B. 1932, pp. 234-236, 238). This is that two cumulative genes (AA′) are involved either of which gives colour with a complementary gene (B). Then the original parents with constitutions Aa A′a′ Bb and aa a′a′ Bb would on crossing give a ratio of 9 pink to 7 white. The figures obtained

were 8 : 6. Assuming that plants with the constitution Aa A'a'BB were selfed to give F_2 the ratio 15 : 1 should be obtained. This fits well for N. 75 and is reasonably possible for N. 76.

Stigmata. The results may be expressed thus :—

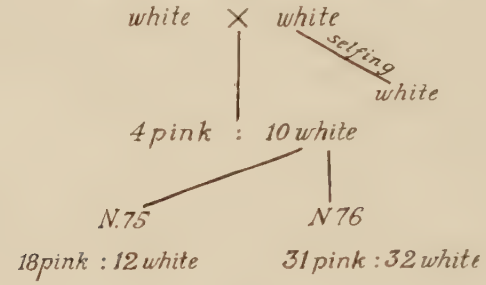

Fig. 5.

Since white F1 plants on selfing segregated in F_2 it is not unlikely that an inhibiting gene is involved (see K.B. 1932, p.p. 234-238).

Ripe capsules : the results obtained are seen from the following diagram :—

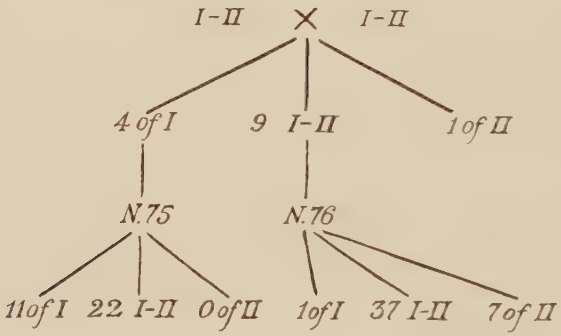

Fig. 6.

The bias towards longer narrower capsules (Type I) in N. 75 and towards shorter broader capsules (Type II) in N. 76 is clearly shown. This is what would be expected from the F_1 plants chosen as immediate parents of the F_2.

Mature seeds : the results obtained are shown in the following scheme :—

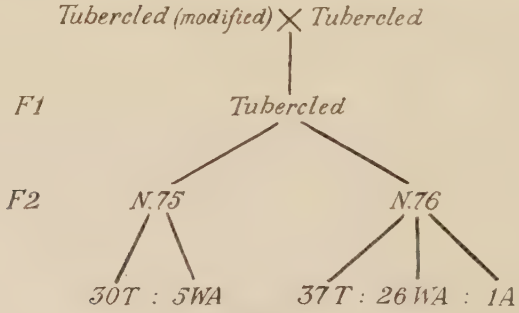

Fig. 7.

The ovule parent (S.–P. 16) had tubercled seeds, but these were modified in the direction of weak armadillo. The pollen parent (S.–P. 11) had normal tubercled seeds. The F_1 was normally tubercled and segregation occurred in F_2. We know that normal armadillo is recessive to normal tubercled and have recognized the occasional occurrence of modifying factors (K.B. 1929, 174 and 1931, 133).

Summary.

1. Two plants of *Silene vulgaris* differing in a number of characters, especially in surface colour and indumentum, were crossed and their offspring genetically analyzed to the F_2 generation.

2. The conclusions reached can be summarized as follows :—

a. Surface of vegetative parts and calyx : " mat " dominant to " shining " with a 3 : 1 ratio in F_2.

b. Indumentum : hairiness dominant to glabrous, with presence versus absence showing 3 : 1 and 5 : 1 ratios in F_2.

c. There is no recognizable linkage between surface and indumentum genes, all possible combinations of characters appearing in F_2.

d. Two plants with petal blotch occurred unexpectedly in one F_2 generation. A similar occurrence has been previously reported (K.B. 1932, 234, 237).

e. The figures for colour in filaments, anthers, immature seeds, and stigmata indicate the presence of cumulative, complementary, and, probably, inhibitory factors.

f. Hermaphrodite and gynomonoecious plants segregate for sex on selfing, the former giving a predominant number of hermaphrodite and the latter a predominant number of female plants.

g. A bias in capsule shape towards the capsule shape of immediate parents is clearly shown in the F_2 generations.

h. The occurrence of a modifying factor or group of factors for tubercled testa resulted in 6 : 1 and 37 : 27 ratios in F_2.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XLVIII—NEW OR LITTLE-KNOWN PLANTS FROM SOUTH INDIA : IV.*

Impatiens Aliciae *C. E. C. Fischer*, sp. nov. [Balsaminaceae] ; *I. ligulatae* Bedd. peraffinis, foliis basi acutis, alis bilobis auricula dorsali tubulari-involuta breviore robustiore instructis, calcari subsaccato differt.

A branched *herb* ; rootstock short, horizontal, woody, rootlets fibrous ; stems slender, glabrous, 20–35 cm. high. *Leaves* opposite,

* Continued from K.B. 1934, 172.

subsessile, linear or narrowly elliptic, acuminate, base tapering or cuneate, 2·5–10 cm. long, 2·5–9 mm. wide, glabrous or minutely papillose-hispidulous and dark-green above, glabrous and glaucous below, midrib subprominent below, lateral nerves indistinct, margins distantly and minutely toothed, the basal 1–3 on either side sometimes elongated and glandular ; sometimes with a pair of short, linear stipular-glands. *Flowers* axillary, solitary or twin ; bracts minute ; pedicels capillary, 1·5–2 cm. long and erect in flower, deflexed and up to 2·5 cm. in fruit, with a line of pubescence on one side. *Standard* oblate, more or less plicate and keeled, apex slightly emarginate, sometimes minutely apiculate, 4–5 mm. long, pink, darker at the centre. *Lateral sepals* linear-oblong, acute, 4 mm. long. *Wings* 10–11 mm. long ; distal lobe much the larger, obovate, deep-pink with a splash of purple-crimson streaks on the inner side ; stipe and short, falcate, acute basal lobe white with purple markings ; dorsal auricle about half as long as the wing, strap-shaped, its edges folded in to form a tube near the green, spoon-shaped apex, the two auricles descending into the spur with their concave sides facing each other. *Lip* cymbiform, subacute, 7 mm. long, pink, its spur tubular-saccate, obtuse, 3 mm. long. *Capsule* ellipsoid, acuminate, 10–11 mm. long, glabrous. *Seeds.* 10–20, subglobose, 2·5–3 mm. long, black, glabrous.

Travancore : near Munnar, 5000 ft., fls. September, *E. Barnes* 616 and 617 (type in Kew Herb.). Kottayam-Munnar New Ghat Road, 2000—3000 ft., September, *E. Barnes* 618. " The dorsal auricles contained a liquid and are apparently nectaries." The specific name adopted is in honour of Mrs. Alice Barnes who accompanied and assisted Professor Barnes in his botanical trips.

Impatiens coelotropis *C. E. C. Fischer*, sp. nov. [Balsaminaceae] ; *I. Walkeri* Hook. affinis, sed robustior, et petiolis longioribus 1–4 glandulis instructis, foliis majoribus glabris, nervis paucioribus, pedunculis brevioribus, bracteis majoribus deciduis, sepalis longioribus ovato-lanceolatis acuminatis, aliorum lobis distalis angustis, vexillorum carina cava, labello viride differt.

A weak glabrous *undershrub* ; stems terete, nodes not swollen ; erect or prostrate and geniculate, green with red patches at the insertion of the leaves, succulent, eventually becoming woody and brown, up to 1 m. or a little more high, erect stems unbranched, the prostrate emitting long slender furred roots from the nodes. *Leaves* alternate, succulent, ovate to narrowly lanceolate, acute or shortly acuminate, base cuneate, acute or rounded, often unequal-sided and decurrent on one side, 5–13 cm. long, 2·5–5·8 cm. wide, with sometimes a few scattered smaller ones, cystoliths numerous, oblong acute or subglobose, bright-green with a velvety lustre above, paler below, eventually becoming yellow and scarlet, when dry dark brown, midrib and 3–6 pairs of primary nerves slightly prominent and pale-green below, margins regularly and closely or

rather distantly serrate, serratures subappressedly apiculate, the basal 1–2 on either side frequently gland-capitate ; petioles terete, channelled above, 1·5–7 cm. long, red, usually bearing 1–4 solitary or paired capitate glands above the middle. *Racemes* axillary, 3–4-flowered ; peduncles solitary, 1–3·8 cm. long ; pedicels 1–4 cm. long ; bracts lanceolate, acuminate, 6–7 mm. long, 2·8 mm. wide, midrib stout, veined, margins entire, early deciduous leaving an elongate scar. *Flowers* up to 2·7 cm. long ; buds subglobose, 4-angled (one very blunt) by the keeled standard and lateral sepals and the lip. *Standard* suborbicular, cucullate, acute, 1·5 cm. long, scarlet, its keel about 2·5 mm. wide, hollow. *Lateral sepals* thick, ovate-lanceolate, concave, acuminate, bluntly keeled, 1·4–1·55 cm. long, scarlet. *Wings* sessile, 1·5 cm. long, 2-lobed, lobes slightly overlapping, the distal oblong-falcate, obtuse, veined, the lateral semi-obovate, rounded, larger than the distal, scarlet with bullate crimson patches. *Lip* deeply cylindric-saccate, slightly compressed laterally, 1·7–1·8 cm. long, 1 cm. across, the anterior part of the mouth with a curved, acuminate beak 4 mm. long, spur 6–10mm. long, tubular, blunt, upcurved with the apex appressed to the front on the sac, bright glossy-green, becoming scarlet at the mouth with a crimson patch on the beak, veins deeply looped in the shape of the sac. *Capsule* ellipsoid-fusiform, 1·5 cm. long, green, glossy. *Seeds* up to 15, more or less kidney-shaped, compressed, 1·4 mm. long, 2 mm. wide, pale brown, minutely papillose.

Travancore : High Range, Nemakad Gap, 6500–7000 ft., fls. and frt. September, *E. Barnes* 597, 598, 599 (type in Kew Herb.), 600, 603, 604 ; Anaimudi Slopes, 7500 ft. fls. September, *E. Barnes* 601, 602, 605.

Professor Barnes notes : " I found this plant in several places in the same region—the Nemakad Gap of the Anaimudi Ridge. Some plants were growing among rocks under trees that bordered streams on the open grasslands. Others were amongst undergrowth in moist shola forest. Others were on a bank ; these were more squat in habit and had stems not more than a foot high and leaves rather closely bunched."

Impatiens leptura *Hook f.* [Balsaminaceae].

This species was first described in the Flor. Brit. Ind. **1**, 467 (1875), based on a rather fragmentary specimen collected by Lieutenant (later Colonel) Beddome in 1861. The collector had doubtfully inscribed it as *I. cordata* Wight and added on his label " or nov. sp. H.f & T. say that *I. cordata* is only a variety of *I. viscida*—this is certainly distinct . . . . differs from '*viscida*' in the much smaller upper petal which in this is vaulted over st : cor : —*texture of leaves* and ped : not being viscid." As a note to his description of *I. leptura*, the author added " I have only fragments of this very distinct species, which is labelled *I. cordata* ? by Major Beddome." The sheet as it now lies in the Kew Herbarium consists

of 3 leafy and flowering terminal shoots and a capsule containing dissections of the flowers and an unripe capsule with some seeds extracted; also pencilled sketches of the floral parts made by Sir J. D. Hooker. Further the sheet has been inscribed in ink, first "*I. elegans* Bedd." (later struck out), and then "*Imp. leptura* Hk. f. Fl. Ind. i, 467." Later in pencil is added "=*cordata* Wight." This change of opinion is confirmed in Sir Joseph's "An Epitome of the British Indian Species of Impatiens" in the Rec. Bot. Surv. Ind. **4**, pt. 3, 48 (1906) where *I. leptura* is cited as a synonym of *I. cordata* and this accounts for the entire omission of the combination in Flor. Pres. Madras, pt. I (1915).

In September 1933 Professor E. Barnes collected specimens of an Impatiens in Travancore which, though resembling *I. cordata* Wight, he was unable to reconcile completely with that species, and sent them to Kew. Comparison with the specimens in the Kew Herbarium confirmed that opinion and showed that they are identical with Beddome's sheet referred to above and lead to the opinion that Sir J. D. Hooker's first view is correct and that *I. leptura* Hook f. is distinct from *I. cordata* Wight and is a good species. Professor Barnes' specimens unfortunately also lack the lower part of the stem and the root system. The two species differ in the following characters :—

I. cordata : *leaves* rounded and cordate or emarginate at the base, lateral nerves nearly straight, arising at an acute angle from the midrib, base devoid of glandular cilia ; *peduncles* 2–5 flowered ; *wing petals* with the largest axis in continuation of the stipe ; *lip* boat-shape ; *seeds* covered with spiral long hairs.

I. leptura : *leaves* acute at the base, lateral nerves strongly arched, arising nearly at right angles from the midrib, the base usually furnished with 1–3 cup-tipped glandular ciliae ; *peduncles* 2–3 flowered ; *wing petals* rather larger and with the longest axis at an angle of about 45° with the stipe ; *lip* bowl-shaped and rather longer ; *seeds* (pilose when young ?) glabrous.

As the original description is not full an amplified one based on all the material now available and on Professor Barnes' notes is appended.

An erect *herb* ; stems green, rough, somewhat angled. *Leaves* alternate, ovate to elliptic-lanceolate, acute or acuminate, base cuneate, acute, 4·5–10 cm. long, 2–5 cm. wide, midrib slightly prominent below, lateral nerves in 5 pairs, rising almost at right angles to the midrib, much and regularly arched, glabrous, or rough with short, stiff hairs on the nerves above, pale and subglaucous (when dry) below, margins, except for a short distance on either side at the base, crenate with short cilia in the sinuses, the entire portion usually with 1–3 glandular, cup-tipped cilia on one or both sides : petioles 1–7 cm. long, glabrous. *Peduncles* axillary, slender, 4–6·5 cm. long, glabrous, 2–3 flowered ; bracts

ovate, 4 mm. long, glabrous, green, deciduous ; pedicels 1·5–2·5 cm. long, fascicled. *Standard* broadly oblong, obtuse, vaulted over the stamens and basal part of the wings, 6–7 mm. long, green becoming pinkish at the edges. *Lateral sepals* broadly ovate, acute, 4·5–5·5 mm. long, green. *Wings*. 2·5 cm. long, pink, distal lobe large, nearly semicircular, its largest axis at an angle of about 45° with the stipe (2·8 cm. long, 1·5 cm. wide), flat with the lower edge narrowly turned over forwards ; basal lobe quadrately oblong, obtuse, 7–8 mm. long, darker pink, erect and partly under the standard. *Lip* bowl-shaped, acute, 1–1·3 cm. long, with a slender, tapering, incurved spur bent to one side, 2·5–3 cm. long. *Stamens* yellow. *Ovary* green, glabrous. *Capsule* (immature) ellipsoid, beaked, 1·5 cm. long. *Seeds*, several, orbicular, pilose (*fide* Hooker, to me they appear to be quite glabrous).

Anaimalais, 4500–5000 ft., *Beddome*. Travancore, a mile or two from Munnar on a bank at the side of the Kottayam-Munnar Old Ghat road, 4500–5000 ft., September, *E. Barnes* 607, 608, 609.

The locality cited by Beddome is " Anamallay Hills " and in the Fl. Br. Ind. this is amplified with the addition of " in Malabar; " but the hills in question are not in Malabar (as now understood), but extend from the S. Coimbatore District into Travancore. There is nothing in Beddome's inscription to indicate in which part of the Anaimalais he found his plant and it may well be that both collectors found it at the same place.

Impatiens platyadena *C. E. C. Fischer*, sp. nov. [Balsaminaceae] ; *I. Wightianae* Bedd. peraffinis, foliis latioribus, labello longiore infundibuliforme, calcare validiore, erecto-curvato differt.

A glabrous *undershrub* with simple, erect angled stems up to 1 m. high. *Leaves* alternate, membranous, elliptic-lanceolate, acuminate, 8–17 cm. long, 3·5–7·2 cm. wide, copiously lineolate especially near the midrib, base cuneate, decurrent on the petiole for up to 1·5 cm., margins shallowly crenate-serrate, crenatures apiculate, midrib and 8–12 arching primary nerves impressed above and slightly prominent below, dark-green and rather dull above, light green and somewhat glossy below, decurrent part bearing 4–8 marginal flattened green-tipped white glands 1·7–3 mm. long ; petioles channelled above, 1·5–6 cm. long, including the decurrent part of the blade. *Racemes* numerous, axillary, solitary, 4–9 cm, long in flower ; peduncles slender, patent or slightly drooping. 2.5–4·5 cm. long ; bracts ovate, obtuse, 8–15 mm. long, persistent. *Flowers* up to about 25 on the raceme, 1·5 cm. long. *Standard* broadly ovate, obtuse, 7–8 mm. long, cream-coloured, mottled with crimson within. *Lateral sepals* nearly semicircular, obtuse, 6 mm. long, cream-coloured. *Wings* sessile, 1·5–1·6 cm. long, distal lobe semiovate, subacute, 1–1·2 cm. long, scarlet, basal lobe short, triangular-ovate, acute or obtuse, cream-coloured, mottled with scarlet and scarlet-tipped. *Lip* narrowly funnel-shaped with an anterior acute projection of the mouth, curved

forward, 1·2 cm. long, pinkish, spur tubular, blunt, upcurved into a semicircle, about half as long as the sac, cream coloured. *Capsule* ovoid, acute and minutely apiculate, 6 mm. long (immature). *Seeds* broadly pyriform, 1·5–2 mm. long, mottled brown, minutely papillose.

Travancore : High Range, Nemakad Gap, 7000 ft., September, *E. Barnes* 613 (type in Kew Herb.), 611, 612.

XLIX—TRIANA'S FLORA NEO-GRANADINA.

T. A. Sprague.

A photostat copy of this very rare work (see *Kew Bull.* 1929, 94), has recently been presented to the Kew Herbarium by Dr. E. D. Merrill, Director-in-Chief of the New York Botanical Garden, and it is now possible to give an account of its contents. The title-page is lettered " Nuevos jeneros i especies de plantas para la Flora Neo-Granadina, por Jose J. Triana. Bogota. Imprenta del Neo-Granadino. 1854." The cover of the book, however, bears the imprint " Imprenta del Neo-Granadino—1855." Since the date 1854 is assigned to the work by Karsten (Linnaea, **28,** 276), and also by Triana and Planchon (Prodr. Fl. Novo-Granat. 209), it may be accepted as correct. In the preface Triana speaks of the various new genera and species as having been discovered during his travels and says that his friend, the German naturalist, Dr. H. Karsten, has had the generosity to associate his name with the work. Since p. 7 bears the sectional title " Viaje de Karsten i Triana " it would appear that all or most of the new plants concerned were collected during Karsten and Triana's journey from Bogota to Quindiu mentioned by Karsten in Linnaea, **28,** 275. The new plants concerned were ascribed by Karsten (l. c. 425-434) to " Karst. et Triana ", whereas Triana and Planchon sometimes gave the authors' names as " Triana et Karst." (Prodr. 95, 215). Apparently the descriptions were the joint work of the two botanists.

The Flora Neo-Granadina contains descriptions of thirteen new genera and twenty-one new species, and a re-description of *Phytelephas microcarpa* Ruiz et Pav. The descriptions of the thirteen genera, and of eighteen of the new species were incorporated by Karsten in the second part of his paper " Plantae Columbianae," published in Linnaea, **28,** 387-462. The title-page of vol. **28,** bears the date "1856," but the volume was issued in five separate parts, and there is reason to believe that part 4 (pp. 385-512) appeared in 1857. Triana and Planchon, Prodr. 95, 209, cite *Dendrostylis* and *Herrania aspera* from Linnaea, " ann. 1857." Furthermore, parts 1–3 (1856) are noticed in Flora, **40,** 286 (14 Mai 1857), but part 4 is not included, which suggests that it did not appear till 1857.

For the convenience of workers on the flora of Northern South America, a complete list is supplied of the names contained in the

Flora Neo-Granadina, followed by references to Karsten's paper, in which the descriptions were reproduced, and to Triana and Planchon's Prodromus Florae Novae-granatensis.

Triana's descriptions of *Anamorpha melochiodes*, *Gulielma chontaduro* and *Oenocarpus iriartoides*, which are apparently omitted from Karsten's paper, are reproduced below.

New Genera and Species.

The following abbreviations are used in the list :—

K.L.—Karsten in Linnaea, vol. **28.**

N.J.—Triana, Nuevos jeneros i especies de plantas para la Flora Neo-Granadina.

Pr.—Triana et Planchon, Prodromus Florae Novae-granatensis, vol. **1** (reprinted from Ann. Sci. Nat., sér. **4**, **17, 18**).

Anamorpha, gen. nov., N.J. 9 ; K.L. 443 (Büttneriaceae) ; Pr. 211, sub *Melochia* L.

A. melochiodes, N.J. 10.—Colombia.

A. walteroides, N.J. 10 ; A. waltheroides K.L. 443 ; Pr. 215, sub *Melochia inflata* Triana et Planch.

Comatoglossum, gen. nov., N.J. 10 ; K.L. 436 (Sapindaceae) ; Pr. 367, sub *Talisia* Aubl.

C. strictum, N.J. 11 ; K.L. 437 ; Pr. 367, sub *Talisia stricta* Triana et Planch.

Brotobroma, gen. nov., N.J. 11 (Büttneriaceae) ; K.L. 446, sub *Herrania* Goud.; Pr. 209.

B. aspera, N.J. 12 ; Herrania aspera, K.L. 447 ; Pr. 209, sub *Herrania pulcherrima* Goud.

Burmeistera, gen. nov., N.J. 13 ; K.L. 444 (Lobeliaceae).

B. ibaguensis, N.J. 13 ; K.L. 444.—Colombia.

Trichantha, gen. nov., N.J. 14 ; K.L. 437 (Convolvulaceae).

T. ferruginea, N.J. 14 ; K.L. 438.—Colombia.

Guilielma :—

G. chontaduro, N.J. 15.—Colombia.

Oenocarpus :—

O. iriartoides, N. J. 15.—Colombia.

Stephanogastra, gen. nov., N.J. 16 ; K.L. 425 (Melastomaceae).

S. purpurea, N.J. 16 ; K.L. 426.—Colombia.

Codazzia, gen. nov., N.J. 17 ; K.L. 426 (Bignoniaceae).

C. speciosa, N.J. 18 ; K.L. 427.—Colombia.

C. rosea, N.J. 18 ; K.L. 427.—Colombia.

Phytelephas :—
P. microcarpa *Ruiz et Pav.*, N.J. 18 ; K.L. 275, 277.

Calycophysum, gen. nov., N.J. 20 ; K.L. 427 (Cucurbitaceae).
C. pedunculatum, N.J. 21 ; K.L. 428.—Colombia.

Kuala, gen. nov., N.J. 21 ; K.L. 428 (Rutaceae-Diosmeae) ; Ann. Sci. Nat. sér. 5, **14**, 306, sub *Esenbeckia* H.B.K.
K. alata, N.J. 22 ; K.L. 429 ; Ann. Sci. Nat. l. c., sub *Esenbeckia alata* Triana et Planch.
K. laevis, N.J. 22 ; K.L. 429 ; Ann. Sci. Nat. l. c., sub *Esenbeckia alata* var. *laevis*.

Loevigia, gen. nov., N.J. 22 ; K.L. 434 (Melastomaceae).
L. sericea, N.J. 23 ; K.L. 434.—Colombia.

Cephalotomandra, gen. nov., N.J. 23 ; K.L. 429 (Nyctaginaceae).
C. fragrans, N.J. 24 ; K.L. 430.—Colombia.

Matisia :—
M. castaño, N.J. 24 ; K.L. 430 ; Pr. 198.—Colombia.

Diplostylis, gen. nov., N.J. 25 ; K.L. 433 (Boraginaceae).
D. fasciculata, N.J. 26 ; K.L. 433.—Colombia

Dendrostylis, gen. nov., N.J. 26 ; K.L. 431 ; Pr. 95 (Bixaceae).
D. suaveolens, N.J. 27 ; K.L. 432 ; Pr. 95.—Colombia.
D. apeibaefolia, N.J. 28 ; K.L. 432 ; Pr. 95.—Colombia.
D. pubescens, N.J. 28 ; K.L. 432 ; Pr. 95.—Colombia.

Anamorpha melochiodes [p. 10], foliis petiolatis, petiolo semipollicari, ovatis vel oblongo-ovatis, dentatis, puberulis ; inflorescentia axillaris apice pedunculi simplicis vel bifurcati (subbipollicaris) glomerata ; petala alba, flavipunctata.

Crescit in convalle fluminis Magdalenae inter Tenasucá et Ibagué, alt. 300–1,300 m. Floret Martio.

Guilielma chontaduro [p. 15]. Palma 30–40-pedalis ½ ped. diametro, ligni nigri, internodio trunci tomento albo tecta, spinis nigris bipollicaribus horrida ; folia 6–8 ped. longa, pinnatisecta, utrinque 80 foliola 1–2 ped. longa, 1–1½ poll. lata, apice acuminata, basi recurvata, margine et costa media superne ciliis spinescentibus parvis obsessus, terna, vel quaterna, vel quina, radio obliquo imposita, ideoque folio adspectum crispi mentientia ; basis petioli vaginam latam, truncum amplectentem formans, extus, facieque inferne radii spinis, setisque nigris tectus ; fructus aurantiaci, flavi, vel corallini, magnitudine *Guilielmae speciosae*, rotundi, (1–1½ poll. diametro) ; pericarpio carnoso eduli crasso.

Crescit inter Piedra de moler et Cartago, ornans vicinos colles. alt. 1,200 m.

Chontaduro incolarum.

Oenocarpus iriartoides [p. 15]. Truncus 60-pedalis, 1. ped. diametro, ligno rubescenti, glaber; folia 8 ped. longa, (petiolo bipedali) radiis superne acute carinata, utrinque circiter 200 foliola, quaternatim aggregata, radio oblique imposita (folium ideoque crispum) 2-3 ped. longa, 2 poll. lata, apice acuta; inflorescentia ex axilla foliorum, spica simpliciter composita formans, spathis duabus inclusa, flores flavi; fructus magnitudine ovi palomae.

Crescit inter Piedra de moler et Cartago ornans vicinos colles, alt. 1,200 m.

Palma real ab incolis dicitur.

L.—MISCELLANEOUS NOTES.

Retirement of Mr. Holland.—John Henry Holland retired from the post of Botanist in the Museums on Wednesday, October 17th, having reached the age-limit after 40 years connexion with Kew.

Mr. Holland entered Kew as a student gardener in 1894. In 1896 he was appointed Assistant Curator of the Botanic Station, Old Malabar, Nigeria, becoming Curator the following year. Unfortunately he had to retire from this post owing to ill health and in 1901 he re-entered Kew as Assistant (later Botanist) in the Museums. Mr. Holland's exceptionally wide knowledge of economic botany and of the Museums collections has been of great service during his long period at Kew. He has plans for further work and his numerous friends will wish him many years of active and happy retirement.

Dr. R. Melville.—Ronald Melville, B.Sc., Ph.D., Research Assistant, Institute of Plant Physiology, Imperial College of Science and Technology, has been appointed as Botanist in the Museums in succession to Mr. Holland.

Ellen Ann Willmott.—The news of the sudden death of Miss Willmott, which occurred at her house at Great Warley, Essex, on September 27th, came as a great shock to her large circle of friends and acquaintances.

For many years past Miss Willmott had held a leading place amongst women in horticulture. From her earliest days she was closely associated with gardens and in her childhood lived at Spring Grove, Isleworth, at one time the home of Sir Joseph Banks. She inherited her love of plants from her mother and on becoming the owner of Warley Place in Essex at a comparatively early age, she was enabled to indulge it to a great extent. In a few years she made Warley, already notable as being the home of John Evelyn the diarist in the latter part of the 17th century, not only one of the most beautiful but also one of the most interesting of English gardens. It was already furnished with fine trees and in

its broader aspects she beautified it further by planting daffodils and other bulbs in great quantities. One of the most striking features were the meadows of *Crocus vernus* which have been there since Evelyn's time.

Miss Willmott had claim to be one of the pioneers in the cultivation of Alpine plants ; for her rock garden, built by Backhouse of York, was one of the first to be constructed on the grand scale and to break away from the dreadful " rockwork " of mid-Victorian times. Here she was successful with many rare and reputedly difficult plants. Other groups in which she specialized were lilies and roses, and she also assembled at Warley one of the most comprehensive private collections of hardy trees and shrubs in the British Isles, much augmented and kept up to date by her financial support of the Chinese expeditions of E. H. Wilson. Miss Willmott also had gardens at Aix les Bains and near La Mortola, and for many years she was in frequent communication with Kew, until lately often paying visits and exchanging plants. She took a pride in keeping her collections correctly named and often sought the aid of Kew towards that end. Miss Willmott's name is perpetuated in the annals of botany and horticulture by her sumptuous work " The Genus Rosa," which she published in two folio volumes in 1914. The beautiful coloured plates were drawn by Alfred Parsons, R.A., and the purely botanical text was contributed by the late J. G. Baker at Kew, Miss Willmott herself furnishing geographical, historical and horticultural notes.

Miss Willmott possessed a fine botanical and horticultural library containing many of the old herbals and other rare botanical works as well as a long series of British and foreign periodicals. In 1920–21 she presented to Kew the very valuable gift of her fine " Herbarium Warleyense " amounting to some 15,000 sheets, from many parts of Europe. The herbarium was particularly rich in French material, collected by French botanists, most of it purchased by her from various sources. The specimens were excellently prepared and with full data, but many required mounting or remounting. This involved considerable labour but most of the collection is now incorporated in the general herbarium.

Miss Willmott was the first woman to be elected a Fellow of the Linnean Society (1904), and also received the V.M.H. when that Honour was instituted by the Royal Horticultural Society in 1897. She was also a Trustee of the R.H.S. Gardens at Wisley. She was a capable musician and a keen attendant at various scientific meetings. In all fields in which she took an interest she was untiring in her pursuit of knowledge and she will be greatly missed in all those spheres of public and private life which owe so much to her interest and many activities.

Poa amboinica *Linn.*—The name *Poa amboinica* was published by Linnaeus in his Mantissa, **2**, 557 (1771). The epithet *amboinica* was adopted from *Phoenix amboinica montana* Rumph. Amb. **6**, 19, t. 7,

fig. 3 (1750), which Linnaeus cited as a synonym. In the brief description the plant is stated to be very like *Poa compressa*. Since neither the description nor the figure in Rumph. Amb. is that of a *Poa* or an *Eragrostis* it is clear that Linnaeus had before him a specimen of some other species. He gave the habitat as " India." Rumphius's plant is apparently a *Sorghum*; indeed, Merrill in Rumph. Herb. Amb. 88 assigns it to *Andropogon*. Unfortunately *Poa amboinica* is not represented in the Linnean Herbarium at the Linnean Society of London.

Trinius in Steud. Nomencl. ed. 2, **1**, 652, recognised Linnaeus's description as that of an *Eragrostis* and transferred the plant as *E. amboinensis* (accepting the alteration of the specific epithet from *amboinica* to *amboinensis* made by Murray in Linn. Syst. ed. 13, 98).

Druce in Rep. B. E. C. 1916, 621, took up the older trivial in the combination *E. amboinicea* (error for *amboinica*).

Retzius pointed out that *Poa amboinica* L. included two distinct species and excluded the Rumphius synonym, retaining the name *P. amboinica* L., of which he published an amplified description in his Observationes, **4**, 20 (1786) based on a specimen he had received under that name from Koenig, which is now in the Lund Herbarium. This plant is certainly an *Eragrostis* closely resembling *E. ciliaris* Link, with which species it has been much confused. It was included as *E. ciliaris* in the catalogue of the Koenig specimens in Kew Bull. 1932, 74, no. 316.

In the Smithian Herbarium at the Linnean Society of London there is a sheet identified, apparently by Sir J. E. Smith himself, as *Poa cynosuroides*, which is not that species but agrees well with the Lund specimen. The Smithian specimen was inscribed in 1785 : " Hort D. Salisbury, e seminibus ex India Or. a Konigio ad D. Banks missis."

In the Herbarium of the Natural History Museum, London, there is a sheet which also agrees with the Lund sheet. It is inscribed (possibly by R. Brown) : " Mr. Schumacher states that this was sent by Koenig to Rottboell under the name of Poa amboinica . . . Retz. fascic. 4." It is not known whether he meant that this very specimen or one identical with it was sent to Rottboell and if it was this same specimen how it came to London. The sheet is also identified in another hand as " Poa pulchella Salisbury."

Poa pulchella was published by Salisbury in his Prodr. Stirp. Hort Chapel Allerton, 21. The short description there given, which agrees fairly well with the Lund sheet, ends : " Sponte nascentum prope Tranquebar, legit Joh. Ger. Koenig."

Koenig was at Tranquebar in South India from 1768 for a few years and sent plants from that region to Linnaeus. It seems certain, therefore, that Koenig sent a South Indian grass to Linnaeus which the latter considered as identical with Rumphius's grass and published the name *Poa amboinica* in 1771. He would have communicated the binomial to Koenig, who thereafter sent specimens either of the same collecting or, at least, of plants he deemed to be

identical with the one so named by Linnaeus, to Retzius and to Rottboell under that name and seeds to Banks.

The brief description furnished by Linnaeus is in no way inapplicable to the sheets referred to in the Lund, Smithian and Natural History Museum Herbaria, but that given by Rumphius and his figure are not compatible with them.

It is clear, therefore, that *Poa amboinica* Linn. Mant. **2,** 557 consists of two species, one from Amboina first described by Rumphius, and the other an *Eragrostis* collected by Koenig in South India. When separating the two, the specific epithet *amboinica* should, presumably, be retained for Rumphius's plant from Amboina and is not, therefore, available under *Eragrostis*. Nor can the specific epithet *pulchella* be retained owing to the existence of the validly published name *Eragrostis pulchella* Parl. based on a different type. However, Dr. R. Pilger has been kind enough to compare a specimen (one plant from Madras, *Barber* 4387), which agrees entirely with the sheet in the Lund Herbarium identified by Retzius as *Poa amboinica*, with the type sheet of *Poa riparia* Willd. in Ges. Naturf. Fr. Berl. N. Schrift. **4,** 185 (1803), and finds that the two agree with a trifling difference in the form of the panicle. *Poa riparia* was transferred to *Eragrostis* by Nees in 1829; it is clear, therefore, that *Poa amboinica* Retz. non Linn. should now be termed *Eragrostis riparia* (Willd.) Nees.

C. E. C. FISCHER.

New combinations under Copaifera.—In the course of working on *Leguminosae* of Tropical Africa, the necessity for the changing of the names of two species of *Copaifera* became apparent. As the two trees in question are of economic interest as producers of gum-resins, it seems desirable that they should be given their correct names under the International Rules of Botanical Nomenclature without delay, and the new combinations together with their respective synonymy are published herewith.

Copaifera copallifera (*Benn.*) *Milne-Redhead*, comb. nov.

Guibourtia copallifera Benn. in Journ. Linn. Soc., Bot. **1,** 150 (1857). *Copaifera Guibourtiana* Benth. in Trans. Linn. Soc. **25,** 317 (1865); Oliv. in Oliv., Fl. Trop. Afr. **2,** 314 (1871); Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 338 (1928); Bak. f., Leg. Trop. Afr. 750 (1930). *Copaifera copallina* Baill., Hist. Pl. **2,** 142, 163 (1870). *Copaiba copallifera* Kuntze, Rev. Gen. **1,** 172 (1891).

Copaifera conjugata (*Bolle*) *Milne-Redhead*, comb. nov.

Gorskia conjugata Bolle in Peters, Reise Mossamb., Bot. 16, t. 3 (1861). *Copaifera Gorskiana* Benth. in Trans. Linn. Soc. **25,** 317 (1865); Oliv. in Oliv., Fl. Trop. Afr. **2,** 315 (1871); Bak. f., Leg. Trop. Afr. 751 (1930). *Copaiba conjugata* Kuntze, Rev. Gen. **1,** 172 (1891); Engl., Pflanzenw. Ost.-Afr., c, 197 (1895).

E. MILNE-REDHEAD.

Gaultheria microphylla (*Forst. fil.*) *Hook. fil.*—During recent work on the Gaultherias and Pernettyas of the southern hemisphere, suspicion that the name *G. microphylla* for the small South American species of *Gaultheria* might be incorrect was aroused by the discovery that Forster's specimens in the Kew herbarium belonged to the Epacridaceous genus *Lebetanthus*: a search in the British Museum herbarium revealed the same state of affairs.

Forster's original description of *Arbutus microphylla* reads as follows :— " Simillima praecedenti [*Arbutus mucronata* Linn. fil.]. Folia dimidio vel triplo minora, et omnino mucrone destituta, licet acuta sint ; tum quoque tenuiora, serraturis magis argutis, margine non revoluto. Pedunculi pariter ac in *A. mucronata*, brevissimi, bracteis pluribus cincti. Habitat cum priore."

Lebetanthus myrsinites (Lam.) Macloskie and the small *Gaultheria* are rather alike superficially, but three points in this description apply to the former and not the latter. The leaves of the *Gaultheria* are not noticeably thinner than those of *Pernettya* (*Arbutus*) *mucronata* ; the serrations are not sharper and there is a thickened—not strictly revolute—margin, much as in *Pernettya mucronata*. This description, however, fits *Lebetanthus myrsinites* very well and seems to establish the fact that *Arbutus microphylla* Forst. fil. is synonymous with it. Skottsberg,* it should be mentioned, has already noted that Forster's specimens are *Lebetanthus*, but thought that he probably collected both plants, a suggestion that does not seem justified in view of the description.

The *Gaultheria* was first described as *Arbutus serpyllifolia* by Lamarck, but the name is not available under *Gaultheria* owing to the earlier *G. serpyllifolia* Pursh.

In the " Flora Antarctica " Hooker figured this plant as *G. antarctica* Hook. fil. but called it *Gaultheria microphylla* in the text. In his own words " When figuring this species, I gave it the trivial appellation of *antarctica*, not being aware of its identity with *Pernettya serpyllifolia*, DC., and *Arbutus serpyllifolia*, Lam., all of which names must yield to that of *G. microphylla*, the plant being undoubtedly the little-known *Arbutus microphylla* of Forster." Since this is now shown to be incorrect, *G. antarctica* becomes the correct name. The more important references and synonymy are :—

Gaultheria antarctica *Hook. fil.* Fl. Antarct. **2,** t.116 (1847).

Arbutus serpyllifolia Lam. Encycl. **1,** 228 (1783) ; Ill. t.366, f.3 (1797).

Pernettya serpyllifolia (Lam.) DC. Prodr. **7,** 587 (1839), excl. syn. *Arbutus microphylla* Forst. fil.

Gaultheria microphylla Hook. fil. Fl. Antarct. **2,** 327 (1847), excl. syn *Arbutus microphylla* Forst. fil.; Gay, Fl. Chile **4,** 359 (1849) ; Macloskie in Rep. Princeton Exped. Patag. 1896–99, **8,** pt. 2, Bot. 645 (1905) ; Reiche, Fl. Chil. **5,** 81 (1901), excl. syn.

* Kungl. Svensk. Vet. Akad. Handl: **56** no. 5, 283 (1916).

Arbutus microphylla Forst. fil. et *Andromeda prostrata* Cav.; Skottsberg in Kungl. Svensk. Vet. Akad. Handl. **50,** no. 3, 45, t.2. fig. 8–10 (1910) ; Vallentin, Flow. Pl. Falk. Isl. t.40 (1921).

Brossaea antarctica (Hook. fil.) O. Kuntze, Rev. Gen. 388 (1891).

Gaultheria serpyllifolia (Lam.) Skottsberg in Kungl. Svensk. Vet. Akad. Handl. **56,** no. 5, 283 (1916) -non Pursh, Fl. Amer. Sept. 1, 288 (1814). B. L. BURTT.

Flora of the Transvaal.*†—The second part of Dr. Burtt Davy's " Manual of the Flowering Plants and Ferns of the Transvaal and Swaziland," which appeared in July, 1932, completes the account of the archichlamydeous families, from the *Malvaceae* to the *Umbelliferae*. The author has therefore now provided the means of determining the names of plants of nearly all those families which appeared in the earlier volumes of the " Flora Capensis," but which are largely out of date. With these two parts and the more recently published volumes of the " Flora Capensis," students of the Transvaal flora are taxonomically better provided for than any others in Southern Africa. But accounts of the large and important family *Compositae*, and of *Rubiaceae*, are still much needed.

As in part I, the general text is preceded by latin descriptions of all the new species of the families dealt with. This is followed by a table from which we learn that the order *Leguminosae*, so dominant a group in all parts of tropical Africa, is represented by as many as 461 species, 23 belonging to *Caesalpiniaceae*, 50 to *Mimosaceae*, and 388 to the *Papilionaceae*. From this table, and from the one published in the first part, it is evident that the flora of the Transvaal is mainly derived, not from the Cape flora proper, but from the great tropical flora to the north. For example there are 28 species of *Hibiscus*, 35 of *Euphorbia*, 32 of *Acacia*, 27 of *Tephrosia*, and a very large number (82) of *Indigofera*, the last mentioned having been elaborated by Dr. N. E. Brown, all these genera being mainly found in the tropics.

The increase of 57 per cent. in the number of known species as compared with the author's check-list of 1911 is phenomenal, due largely to exploration under the auspices of the Botanical Survey. Much more field work is necessary, however, especially in the mountainous Eastern Transvaal before we can have an adequate knowledge of the flora of this interesting province.

The part under review is priced at 25s. net, an increase of 10s. on the first part, the general text occupying pp. 273-522, with forty black and white illustrations, a noted improvement being the reduction in the number of abbreviations. J. HUTCHINSON.

* A Manual of the Flowering Plants and Ferns of the Transvaal with Swaziland, South Africa, by Joseph Burtt Davy. Part 2. Malvaceae to Umbelliferae. Longmans, Green & Co., Ltd., London, 1932. Pp. 529, 40 illustrations. Price 25s.

† See K.B 1926, 303.—It is much regretted that owing to an oversight a notice of the second part of this important work did not appear at an earlier date.

The British Pharmaceutical Codex, 1934.—This important work, which provides a book of reference for pharmacists and medical practitioners, shows a distinct advance on previous editions. The scope of the work has been considerably extended, as can be seen from a glance at pp. xii-xiv of the Preface, where some important additions are enumerated. The arrangement certainly facilitates consultation. Part I contains the general monographs, in alphabetical order, on the drugs and chemical substances, each monograph starting with the name followed by the synonymy, general description both macro- and microscopical, substitutes, standard, and action and uses. These monographs occupy nearly two-thirds of the entire volume. Then follows part 2, Surgical Dressings; part 3, Formulary; and part 4, Appendices containing tables, general tests, reagents, etc., concluding with a full representative index.

Although primarily intended for the pharmacist and medical man, this reference work is also indispensable to the botanist, particularly the economic botanist. The monographs dealing with the vegetable drugs embody much information which is difficult to obtain from general botanical works. Each monograph shows careful preparation, the classification is mainly in accordance with modern ideas, and the nomenclature on the whole follows the International Rules of Botanical Nomenclature, as revised at Cambridge in 1930. It is gratifying to see that for the plant yielding lavender oil the name *Lavandula officinalis* Chaix is retained and for the species yielding spike oil the name *Lavandula latifolia* Vill. As the result of an enquiry from the Pharmaceutical Society, the somewhat involved nomenclature of these two species was worked out (Kew Bull. 1932, 295), and it was suggested that *Lavandula Spica* L., a name which causes confusion, having been applied both to *Lavandula officinalis* Chaix and *L. latifolia* Vill., should be treated as a "nomen ambiguum" and placed on that list at the next International Congress to be held at Amsterdam in 1935.

Several additional monographs are included in the present edition of the Codex. Special mention may be made of *Ephedra sinica* Stapf, *E. equisetina* Bunge and *E. Gerardiana* Wall., from whose dried young branches are obtained alkaloids which are used largely in the treatment of asthma. *E. sinica* Stapf was described as lately as 1927 (Kew Bull. 1927, 133).

Another interesting addition is Azorubrum, which is used in the place of cochineal and cudbear as a colouring agent for medicines and foodstuffs. Formerly there was no synthetic dye to replace cochineal, obtained from the dried female insect (*Dactylopius coccus*) that feeds on various species of *Nopalea* (*Cactaceae*) and cudbear obtained from species of *Roccella*, lichens found chiefly on the Canary Islands, Madagascar and African coasts. Azorubrum (Bordeaux B) apparently has greater permanence of colour than cochineal and cudbear and is unaffected by dilute acids and alkalis or by exposure to sunlight.

Space does not permit the mention of the many other additions and improvements in the 1934 edition. The Codex is printed on good paper and the letter press is pleasing. The editor and authors, as well as the publishers, are to be congratulated on the production of so comprehensive an Imperial Dispensatory.

M. L. GREEN.

Welsh Flowering Plants.*—The authors of this handbook are to be congratulated on producing the first complete list of the phanerogamic flora of Wales. Introductory matter, including a useful summary of Raunkiaer's life-forms, and an analysis of the flora county by county, occupies about 30 pages. In the section on Montgomeryshire, Briedden Hill is described erroneously as "a . . . limestone mass." In fact the rocks are granitoid, chiefly Anderite, and, although the constituent felspar may contain calcium, there is no free limestone. This makes the occurrence there of *Veronica hybrida*, usually a limestone species, all the more interesting.

In the catalogue proper, much information is condensed under each species. After the Latin and English names, Raunkiaer's life-form is indicated by an abbreviation, followed by the usual habitat of the plant (sylvestral, paludal, etc.), the type of distribution in Britain as a whole (germanic, atlantic, etc.) and the Welsh counties where it has been recorded, with more detailed records for rare plants. Further information (as to status of aliens) is given by the use of different types, asterisks, etc.

As regards nomenclature, the aim of the authors has been to follow the International Rules, but the delay in the publication of the third edition must have made their task rather difficult. The generic name *Cnicus*, which was conserved in 1905 for the monotypic *Cnicus benedictus* (Internat. Rules, ed. 2, p. 103) is used for the genus correctly known as *Cirsium*. The combination *Coronopus verrucarius* (Garsault) Muschl. et Thell. is illegitimate, as was shown by Schinz and Thellung in 1909. The correct name for the species (under *Coronopus*) is *C. procumbens* Gilib.

The pronunciation of each name is given. The stressed syllable is indicated by an accent—grave in the case of a long vowel and acute for a short one. The accentuation seems to have been done with great care, only a few apparent errors having been detected. In the words *Conium* and *radicans* (*Caltha*) the stress should fall on the penultimate syllable, the "i" being long in both cases, according to Lewis and Short. To busy systematic botanists this handbook will be an invaluable guide to pronunciation, though the correct mode will sometimes come as a shock, as in *Trifólium médium* (all vowels short) and *Gálium saxàtile*. Its publication

* Welsh Flowering Plants. A Handbook to the Collection in the Welsh National Herbarium. By H. A. Hyde, M.A., F.L.S., and A. E. Wade, F.L.S., Cardiff, 1934. Published by the National Museum of Wales and by the Press Board of the University of Wales. Pp. vii. + 179, 2 plates and 8 figs. Price 5s.

should raise the present rather low standard of pronunciation in this country.

All those interested in the British flora will welcome the publication of this work, not the least valuable part of which will be the assignment of each species to one of Raunkiaer's life-forms, a task never before attempted for the flora of a large area of Britain.

The Myxomycetes.*—The scope of this work is indicated by the subtitle—" A descriptive list of the known species, with special reference to those occurring in North America." It is based on the second edition (1922) of the late Professor Macbride's " North American Slime Moulds," but inasmuch as the whole of the *Myxomycetes* are now dealt with it covers considerably more ground.

As compared with the third edition of Lister's *Mycetozoa*, the number of genera and species is increased by the inclusion of those which have been described since 1925. It represents also another point of view, in that many species are maintained which Miss Lister considered to be synonymous with other species or at most varieties. " We have felt justified in applying a distinctive specific name to any form which shows reasonable constancy under varying conditions, even though occasional intermediate forms may appear."

The true " slime fungi " only are dealt with, the *Acrasiae*, *Plasmodiophoraceae*, and some smaller doubtful groups being omitted. Of the *Myxomycetes* proper, the two groups *Exosporeae* and *Endosporeae* are recognised. While the arrangement of the *Endosporeae* resembles in the main that of the Lister monograph, there are differences in the grouping into families and orders. Four orders, *Physarales*, *Stemonitales*, *Liceales* and *Trichiales*, correspond to the suborders of Lister. *Diderma* and *Physarina* are placed in the family *Didymiaceae*, and *Diachaea* is found in the *Stemonitaceae* instead of in the *Physaraceae*. *Amaurochaete* and *Brefeldia* are included in the *Stemonitaceae*, but a separate family *Lamprodermaceae* is constituted for *Lamproderma* and its allies. In the *Trichiales* a fourth family *Perichaenaceae* includes *Perichaena*, *Ophiotheca* (held distinct) and *Minakatella*.

One new species, *Badhamia gracilis* Macbr., is described, without a Latin diagnosis. The new name *Physarum Listeri* Macbr. is proposed for *Physarum luteo-album* Lister, non Schum.

As regards nomenclature, the authors have endeavoured to follow the International Rules as revised at Cambridge in 1930. In " Supplementary Notes " at the end of the volume, however, they explain their reasons for retaining certain well-known names which are contrary to the Rules. Some of these are later homonyms and must be rejected. Other specific epithets have been retained even although the synonymy given indicates the necessity for a

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*By Thomas H. Macbride and G. W. Martin. The Macmillan Company, New York, 1934. Pp. xi + 339. 21 uncoloured plates. Price 25/-.

change, because of the tentative nature of much of the synonymy in this group.

An appendix gives a list of names which are of uncertain application or do not refer to *Myxomycetes*.

The book is clearly printed and the matter well set out, keys being given for families, genera and species. There are 21 uncoloured plates giving habit sketches and details of spores and capillitia.

E. M. WAKEFIELD.

Botany as Part of a General Education.*—The appearance within five years of one reprint and a second edition of a botanical text-book shows that it has met a definite need. As compared with the first edition the work has been increased by 93 pages and 47 text-figures, and the subject matter has been partly re-arranged, the chapter on " water and dissolved material " now coming more appropriately after those on the structure of the root, stem and leaf.

The Introduction is followed by chapters on the fundamental structure of plants, the structure and functions of the root, stem and leaf, the relations of the plant to water and dissolved material and to food, and the relation of living things to energy. Chapters on growth, stimuli and responses, reproduction, heredity, and the nature of life complete the first part of the book, which is entitled " The living plant." The second part dealing with " The kinds of plants " begins with an " introduction to the plant kingdom," followed by six chapters on the Algae, Fungi and Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms respectively. Only 44 pages are devoted to the Angiosperms, ten orders of Dicotyledons and six of Monocotyledons being briefly noticed. Discussions of the origin and evolution of life, and the distribution of life, complete the main body of the book. Questions for review and discussion, and a list of books for reference, are appended. The text figures are abundant and well chosen, many of them being original.

To quote the preface, " the book is intended for general students as part of an education which all should have. It is not intended to lay the foundations for professional botany." Hence the treatment is broader than in most works of the kind. The Introduction, for example, includes sections on the scientific method and its results, and a discussion of teleology is appended to chapter X on stimuli and responses. The work will be useful to the general student and the amateur, to whom its wide scope and predominantly physiological bent will recommend it. The chapters on heredity (pp. 220-46), the nature of life (247-55), the origin of life (499-510), and the evolution of life (511-536) bring together much information

*Botany; a text-book for College and University Students, by William J. Robbins and Harold W. Rickett. Second edition. D. Van Nostrand Company, New York. 1934, pp. xi + 628, figs. 431. Price $3.75

not to be found elsewhere within the limits of a single volume.

The method of treatment of the subject, however, and the occasionally somewhat unorthodox or lax terminology employed make the work unsuitable for use as an academic text-book in this country. Thus the terms " spermatozoid " and " ovum " do not occur, being replaced by the wider ones " microgamete " and " megagamete ; " and the meristeles of *Pteridium* are termed fibro-vascular bundles. It is, however, refreshing to come across a botanical text-book written on more or less original lines. Teachers of elementary botany may be able to cull useful hints from Messrs. Robbins and Rickett's book.

T. A. SPRAGUE.

Plant Distribution in the Aberystwyth District.*—Professor Newton's book is designed as an introductory survey of the vegetation of the Aberystwyth neighbourhood and should prove of great value both to those who wish to obtain a bird's-eye view of the plant communities of this little-known area and to students intending to make detailed investigations on any particular vegetational unit.

After preliminary sections on the physiography and geology of the region and on aims and methods in ecology in general, Professor Newton describes in some detail the various communities found in the area under the five headings of Maritime Coastal Associations ; Cultivated Areas, including Lowland Grass-land and Arable Land ; Woodlands ; Bogs ; and Moorland and Hillpasture. Lastly the factors influencing distribution are discussed. One of the most important is considered to be altitude, while the direction of the prevailing winds and the underlying geological formation both play their part. It is a pity that, in a scientific work, the date of publication should have been omitted.

The book, which is illustrated by photographs and by maps showing the distribution of vegetation, should receive a warm welcome from all students of ecology.

Botanical Magazine.—Part 4 of volume 157 was published on October 1st and concludes the volume for the year 1934. It contains an excellent portrait of Dr. Otto Stapf, to whom it is dedicated in the following words : " To the memory of Otto Stapf, Ph.D., F.R.S., V.M.H., F.L.S. for eleven years Editor of this Magazine Who by his remarkable knowledge of plants deep appreciation of their beauty and by his indefatigable industry in Research raised it to a pre-eminent standard of excellence and usefulness This volume is dedicated in gratitude and admiration by the Royal Horticultural Society."

The following plants are figured ; *Tulipa kuschkensis* B. Fedtschenko (t.9370), a fine scarlet tulip from Russian Turkestan ; *Pieris formosa* var. *Forrestii* Airy-Shaw (t.9371), a new variety with larger flowers than the type and with an exserted style, found in

*By Lily Newton. M.Sc., Ph.D., F.L.S., Professor of Botany. University College of Wales, Aberystwyth. Cambrian News (Aberystwyth) Ltd. No date [published 1933]. Pp. 50. Illustrated. Price 3s. 6d.

N.W. Upper Burma and Yunnan; *Muscari cyaneo-violaceum* Turrill (t.9372), a new species allied to *M. Vandasii* Velenovsky, from Eastern Bulgaria; *Viburnum alnifolium* Marshall (t.9373), a native of Eastern Canada and E. United States; *Azara lanceolata* Hook.f. (t.9374), from Southern Chile and Western Patagonia, a species originally discovered by Charles Darwin during the voyage of the "Beagle" in 1834, with fine mauve-coloured fruits; *Rhododendron Bachii* Léveillé (t.9375), a member of the *Ovatum* series from Central China; *Maxillaria fucata* Reichenbach f. (t.9376), probably a native of Ecuador; *Agathosma perdita* Hutchinson (t.9377), a new species allied to *A. pilifera* Schlechtendal, from South Africa; *Iris kashmiriana* Baker (t.9378), a white-flowered *Iris* formerly known as *Iris Bartoni* Foster, found from Kashmir to Afghanistan; *Megaskepasma erythrochlamys* Lindau (t.9379), an interesting greenhouse plant with crimson bracts, a native of Venezuela, and *Ranunculus asiaticus* var. *albiflorus* Linn. (t.9380) a fine white-flowered form collected by Mr. G. P. Baker in Crete.

Nicholas Edward Brown.—We have to record with deep regret the death on November 25th, at the age of 85, of Dr. N. E. Brown, A.L.S., Assistant in the Herbarium from 1873 to 1914. An account of Dr. Brown's work will appear in a subsequent number of the The Kew Bulletin.

The South African Botanist at Kew.—Mr. R. A. Dyer, M.Sc., who has been Botanist for South Africa at Kew since February 1931, has returned to take up the position of Botanist in the Division of Plant Industry, Department of Agriculture, Pretoria. Dr. H. G. Schweickerdt, B.Sc., Agrostologist of the Department, has been seconded to Kew by the Government of the Union to succeed Mr. Dyer.

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